Complete Course in

MASSAGE, SWEDISH MOVEMENT *and* MECHANICAL THERAPEUTICS

BASED ON THE TEACHINGS OF PETER HENRIK LING FOUNDER OF THE **ROYAL CENTRAL GYMNASTIC INSTITUTE** STOCKHOLM, SWEDEN AND SUPPLEMENTED BY ORIGINAL DISCOVERIES AND TEACHINGS. A PRACTICAL COURSE IN **MANUAL TREATMENT as APPLICABLE TO SURGERY AND MEDICINE**

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A COMPLETE COURSE IN

Massage, Swedish Movement

AND

Mechanical Therapeutics

With the advancement in the knowledge of the different structures of the human body and the ailments of these organs, there has been brought to the notice of medical men, a number of measures for the relief of pathological conditions in connection with or independent of medicine giving. To-day the doctor is paying more attention to the diet and habits of his patient, to his hygienic surroundings and environments than he ever did in the past; and he is using such measures as exercise, baths, massage, etc., instead of relying upon drugs wholly, as was the case formerly. Among the most valued of the non-medical means for assisting in the removal of waste products which, if left in the system, would be breeders of disease; for the restoration to the normal condition of a stiffened muscle or joint; for the removal of local congestions, and for the relief of pain, is **massage.**

For a proper knowledge of how massage should be used, it is necessary that we become perfectly familiar with the construction of the body. We **must** know where the blood vessels are located; we **must** know where the different muscles are situated; we **must** know where the different bones are, and the muscular attachments; we **must** know where the different nerves course through the tissues; we **must** know the direction of the blood current; and we **must** know the direction of the muscle fibres. Massage must be used in a scientific manner, in order that good results may follow. Properly understood and properly applied, it becomes a most valuable adjunct in the management of disease. It is to the nurse that the medical man must look for the application of this measure, and it stands the nurse in hand to be perfectly familiar with its every detail. Massage means more than simply rubbing a part of the body; it means the application of scientific principles to the relief of human suffering. Massage is not new, as it is known to have been employed by the Chinese 3,000 B.C., and from that time up to the present it has been used for the relief of disease. Massage was used extensively by the French two hundred years ago, but it remained for the Scandinavians and Germans to place it upon a scientific basis. Peter Henry Ling of Stockholm, in 1813, introduced his system of movements called "Swedish Movements," and since that time, the two have been used in connection with each other, and each year has seen an added interest manifested in the medical profession regarding the employment of these measures in a scientific manner.

To-day there is hardly a general practitioner or specialist but has one or more patients under his care upon whom one or other of these systems is being used. The movements done on the body are classed as massage, while the movements done with the body are classed as Swedish movements. These movements may be active or passive; an illustration of the active movements would be where, by his own will, the patient either flexed or extended his arm; while a passive movement would be the operator making these motions for the patient, using the same part of the body for the operation.

Resistive movements—an illustration would be—two men wrestling: both are on the alert to resist any movement made that would give to one or the other the advantage: each of the contestants in this case, would represent a patient or a masseur. Active and resistive movements act strongly on the muscles. The passive movements are, of course, made by the operator, and are used principally on the blood vessels, lymphatics and nerves supplied to joints: the movement of the joints, of necessity, moving these structures also. To Dr. Mezger, of Amsterdam, is due the credit of placing massage upon a scientific basis. In this country, in 1877, Dr. Weir Mitchell proved its usefulness in the treatment of nervous disorders, and since then it has been taken up by the leading physicians throughout the world. Massage is not to be considered as a cure-all, but in properly selected cases, it becomes a valuable adjunct in the treatment of disease. The rubbing in the Turkish bath is very agreeable and pleasant, but it is not massage.

Mechano-therapeutics comprises both massage and gymnastics, and never should be used unless under the direction of the medical attendant. There are many conditions of disease which might yield to the employment of this agency, but where its use would be contra-indicated because of starting into activity some pathological process which has been lying dormant, but which, under the stimulus of massage, has become active again. The reduction of an inflammatory exudate around a tubercular lesion of the skin by the use of massage, may be attended by the picking up of some tubercle bacilli from the lesion by the circulation and their transmission to the lungs, setting up a phthisis that may cause the death of the patient. The physician knowing the nature of the local lesion will not order massage in these cases; while the non-medical person could not see the danger of mechano-therapy. A few illustrations of conditions that have been followed by bad results when massage was used for their relief will be cited as a caution to the masseur to use his art only under the direction of a physician.

It is known that muscular exercise will increase the amount of albumen in the urine of patients suffering from inflammation of the kidneys. In the anasarca (bloating) that is present in this affection, passive movements and massage have been used as a palliative measure, and it will readily be seen that a constant watch must be kept upon the amount of albumen in the urine, and, if it is increasing, the measure must be discontinued. In gastro-intestinal conditions, if wrongly applied, it does great harm—peritonitis resulting from its use. An instance is given of an appendicitis rupturing into the abdominal cavity under the use of massage, and a death during the seance where massage was being used on a thrombosed vein. These accidents would not have occurred had mechano-therapy been used under the direction of a physician; the conditions would have been recognized and the massage not recommended. These instances are simply given that the student may appreciate the scope of the use of movements and massage, and of the dangers that follow the indiscriminate use of a measure, the proper use of which is attended by the best results.

What is Massage ? The name comes from two words, one of which signifies to **knead,** and the other to **press,** and means the scientific manipulation of the soft tissues of the body. The skin and muscles are treated by the processes of kneading, pressing, stroking, rolling, squeezing and tapping.

Sneve says that mechano-therapy increases metabolism in all the tissues; increases the body temperature temporarily; increases frequency of respiration; increases the number of red corpuscles; increases the quantity and changes the character of the urine; poisonous substances are set free for elimination; improves mal-nutrition. Formulated as follows:

a—Functions of the skin are improved.
b—Blood is attracted to the surface from internal organs.
c—The current of blood and lymph is quickened.
d—Effete matter is eliminated.
e—Swelling and thickening of tissues is reduced.
f—Adhesions of soft parts are broken up.
g—Nerves are stimulated or soothed.
h—Nutrition is improved.

There are a number of terms used in the description of movements and it is necessary to become familiar with them. The movements of the articulations will be described when we take up the anatomy of a part.

Movements then may be:

a—Active—A movement that is executed by the patient's own will and power is an active motion, and brought about by the contraction of voluntary muscles which are under the control of the will. Active movements performed by the patient without any aid from an operator have a limited field in the treatment of disease, but have much to do with the proper development of a perfect, healthy, physical being.

b—Passive—A movement that is executed upon, or with the patient's body without his will or power, and it is the passive movements that form a large portion of mechano-therapy.

c—Assistive active movements are those in which the patient is instructed to aid the operator. He is to put his will power into action, is to use his voluntary muscles, or is to assume a position that will facilitate the movements that the operator is endeavoring to accomplish.

d—Active resistive movements are those in which the patient resists by his will and power the efforts of the operator, or the operator resists the patient's attempts at moving certain parts of the body.

Of the Passive movements there are really only two divisions, and these are in the direction of the blood currents—one following the course of the venous current and the other the arterial.

e—Centripital—where the force is directed from the periphery of the body toward the centre and is in the direction of the venous blood current.

f—Centrifugal—where the force is directed from the centre towards the periphery of the body, in the direction of the arterial blood current.

Describing the kinds of movements that are used by the masseur, are the following:—

a—Effleurage—under which head come all stroking movements.

b—Petrissage—all movements having pressure as their object.

c—Tapotement—all movements having percussion for their purpose.

d—Friction—a heavier motion than stroking, but like it in character.

e—Vibration—a more or less rapid to and fro movement.

A better description of these movements will be given in our next lecture. A general massage treatment can be used for a variety of diseases; it is a tonic and a restorative.

A special massage treatment is used for local injuries, or for local manifestations of disease.

If massage is to be given at the home of the operator, a suitable couch must be provided; it should be about thirty inches wide, comfortably padded, and about twenty-seven inches high. It would be better covered with some material that can be kept scrupulously clean. Of course, the covering is not to come in contact with the patient's body, as sheets will be thrown over the couch. The room should be kept at a temperature of about 70 degrees Far. When visiting patients at their homes, these conveniences for massage will not be found, but in all cases the patient's comfort and benefit must be considered, and the masseuse must make the best of it, and make herself as comfortable as possible in order to be able to do her best work. The patient does not need to remove the night-dress for treatment, as an extra blanket can be used to cover up the parts of the body which are not being worked to protect them from drafts, which are always to be avoided in giving massage. Patients must always be kept warm, with no part exposed but that which is being manipulated. If the patient is subject to cold feet it is best to put on bed socks made of some soft woolen material after manipulation in order to keep up the heat that has been generated. Hot water tins are not generally used or needed, but in persons that are suffering from some heart affection, it will be best to use them after massage. Remember that active movements will decrease the adipose tissues and harden the muscles, while passive movements will allow more fat to accumulate between the muscles and beneath the skin.

Influence of Movements

Lecture No. 2

As already noted, we have seen that there are two kinds of movements, viz.:—Active and Passive, and no sharp and fast line of distinction can be drawn between the two. Still there are some points of minor difference which will be referred to when we come to take up their application in pathological conditions.

Let us see what the effects of movements are on the healthy body:—

(a) The digestion.
(b) The different tissues.
(c) Absorption.
(d) Respiration.
(e) Blood current.
(f) Secretion and excretion.
(g) Nervous system.

INFLUENCE OF MOVEMENTS ON DIGESTION.

It is a well known fact that all exercise increases the appetite, but the appetite is only a means that the system has of making known a want of material for nutrition. But it will be found that with this increase of the appetite there is an increased activity of those organs that secrete the digestive ferments. For instance, the desire for food increases the salivary production, "makes the mouth water," and the starch digestant is formed in anticipation of the food. The stomach is in a state of constant motion during stomach digestion, and movement aids in mixing the food with the stomach secretions. Movements influence the flow of the bile from the liver into the intestine where it exerts its influence on the partly digested food it meets there. Movements assist the process of defecation, and they are of immense service in overcoming constipation.

INFLUENCE OF MOVEMENTS ON THE DIFFERENT TISSUES.

The effect of the blood current upon the muscular, osseous, or gland tissue can well be understood. Any lessening of the blood supply to the part must be followed by atrophy of the tissue; any interference with the venous current must interfere with the elimination of the waste products. Massage of the blood canals in the direction of the currents must increase the flow of the blood to the part, or from the part. All movements are stimulants to growth, as shown in the extra development of the athlete. A careful application of movements will overcome muscular irritability, and the muscles and the ligaments will grow strong and more elastic under massage.

THE INFLUENCE OF MOVEMENTS ON ABSORPTION.

The veins and lymphatics are the principal organs concerned in absorption, the purpose of which is to get new nutritious material into the blood. Motion of a solution of nutritive matter increases the facility of its absorption; movements by forcing onward the lymphatic and blood currents, assist the process. (Read up the processes of endosmosis and exosmosis to become familiar with the process of absorption.)

THE INFLUENCE OF MOVEMENTS ON RESPIRATION.

A large and roomy thorax gives ample space for lung action, and trained exercise of the respiratory muscles will increase the capacity of the thoracic cavity. The inspiratory movements are performed by the diaphragm and the intercostal muscles principally; these muscles are strengthened by gymnastics. The expiratory action is due to the elastic tissue of the lungs with the aid of the abdominal muscles. Movements of respiration, by increasing their frequency, or by increasing the length of the inspiratory act, will not only increase muscular development, but will, at the same time, increase the pulmonary circulation, furnish more oxygen to the blood and eliminate more carbon dioxide.

(Read carefully the article on respiration.)

INFLUENCE OF MOVEMENTS ON THE BLOOD CURRENT.

Rub the back of your hand toward the elbow and see how easily the veins are emptied of their contents. Movements assist the blood currents. The contraction of the muscles presses the contents of the blood canals out, and an alternate contra-action and relaxation must increase the flow of blood, and, as a result, we will have a pulse increased in strength and fulness, and higher temperature of the part. Movements of certain portions of the body will then increase the flow of blood to the part, and draw it from other parts, a fact that can be made use of where we want to relieve congestion of an organ by removing a part of its blood supply. Medical gymnastics of the joints by contracting and dilating blood vessels will increase the flow of blood through the vessels. Active movements increase the circulation and the heart's action at the same time; while passive movements do not increase the heart's action. This is one of the differences referred to between active and passive movements, and has an important bearing upon the treatment of a patient with massage, who may be suffering from some cardiac affection. Passive movements might be indicated, while active movements might do serious harm (Read up the circulatory apparatus in your Anatomy, and the circulation in your Physiology.)

THE INFLUENCE OF MOVEMENTS ON SECRETION AND EXCRETION.

The function of any gland will depend upon its blood supply, and as we have seen that the capillary plexus surrounds the ultimate elements of gland structure, it must be evident that the more blood sent to the structure (within certain limits), the more work will the gland perform. Movements that will increase the blood supply to the part, then will increase secretion, and the same holds good regarding excretion; the more material that is brought to the excreting organ, the greater will be the excretion. Of course, it is always to be understood that we have reference to the normal capacity of the organ. If we should put upon an organ more work than it can do, injury to the structure must follow. The flow of urine from the kidney will be hastened by movements of the abdominal muscles and the involuntary muscles of the bladder, all of which can be strengthened by appropriate movements. The functions of the skin can also be improved by massage, and more material eliminated by the cutaneous structure. (Read up in your Anatomy and Physiology the structure and functions of the glands of secretion and excretion.)

THE INFLUENCE OF MOVEMENTS ON THE NERVOUS SYSTEM.

The health of any organ of the body must depend upon its getting the necessary amount of nourishment, and if some portion of the nervous system has an insufficient quantity of food, it will not do proper work. By massage we are able oftentimes to increase the blood supply and restore the organ to its normal condition. Muscular contractions can be brought on by mechanical stimuli, and friction over certain nerves will generate nerve force. Massage and movements will assist in restoring lost nerve force; an unused organ will atrophy and lose its function. The nerves of a paralyzed leg lose their power of transmitting motor stimuli, if the muscles are left without any effort being made to restore their action, but movements of the parts will keep the nerves in action. (Read carefully about the Nervous System in your Anatomy and Physiology.)

We must devote some time to the description of some of the movements of massage, and will take up:—

1. **Stroking Movements**—These movements may be given with the whole of the palm or simply with the tips of the fingers, exercising various degrees of pressure upon the part. The pressure should always be made in the direction of the flow of the venous blood current, that is from the extremities toward the centre. The hand is not lifted from the body at the end of the stroke, but is returned with a very light touch. The movements will be slow if we wish to massage swollen and tender parts, or if we wish to produce a soothing effect, or to induce sleep, as in the treatment of sprains or joint inflammations or insomnia. If using the tips of the fingers they should be held together but not stiffly, and twenty or thirty upward strokes made over each part, if it be one of the extremities. If used simply to soothe or produce sleep, circular movements may be made over the spine or on the forehead; the same movements may be made by using the whole palm, placing one hand on each side of the limb, or by separating the thumbs and grasping the limb with the fingers beneath. Movements that are not for soothing purposes should be made rapidly—from 100 to 150 per minute—if used below the knee, and from 70 to 100 if used on other parts of the body. Stroking movements act on the skin and cutaneous blood vessels and nerves; they quicken the circulation in the blood-vessels and lymphatics. Friction with the tips of the fingers is the massage used when only small por-

tions of the body are to be treated, as the breasts, feet, head or hands, and where a single finger joint is to be treated, the thumb alone will be sufficient, using the first two fingers of the same hand as a support. Palm friction is used when large portions of the body are to be treated —as the trunk and the legs. When massaging large surfaces the hands should follow each other forming a part of a circle with each stroke. The hands of the operator must be kept in the best possible condition for her work, and she should massage her own hands, manipulating each joint and working the muscles well up. The masseuse should become ambidextrous, educating the left hand to do the work as well as the right.

PRESSURE MOVEMENTS OR KNEADING.

The stroking movements have their application upon the skin, while the pressure movements are for the purpose of reaching the deeper structures, such as the deep lymphatics and blood-vessels, the muscles and the deep nerves. With this variety of massage you may pick up a single muscle and manipulate it from origin to insertion, or you may massage a single nerve trunk or a single lymphatic gland. Herein lies the necessity for an anatomical knowledge as already stated. In pressure massage of single structures the thumb and forefinger are usualy employed, and the muscle or nerve, as the case may be, taken between them and rolled with the thumb, keeping the finger stiff, moving with each operation until the whole muscle has been treated. If a group of muscles are to be treated, both hands are used with the fingers on one side and the thumbs on the other and the muscles rolled, as in the case of a single muscle, moving forward after repeating the process at the same spot five or six times. Another method is to use the heel of the hand as an opposing surface against the fingers, or the part may be grasped by both hands and the massage made by holding the part with the fingers and making the pressure with the balls of the thumbs or heels of the hands, keeping every part of the hands in contact with the flesh. The progress from the extremity towards the centre should be gradual and in somewhat of a spiral manner, or both hands may grasp the part, the leg for instance, and twist the tissues from side to side. There is another pressure movement that is very useful in obesity, and that is the pinching up of the skin and fat above the muscles, and rolling and pinching it between the thumb and fingers.

Movements and Anatomy

Lecture No. 3

In the various pressure movements the muscles are lifted from their bony connections, and the lymph is forced out of the "lymph spaces" into the lymph vessels, veins are emptied and filled. To accomplish this the kneading and pinching and rolling must be thorough and reach the deep tissues. Force is never necessary. A very delicate touch is needed when using "kneading" on the intestines, and digital kneading in patients who have much adipose tissue in the abdominal wall is well nigh impossible, but where the walls are thin, and the patient in a position that will relax the abdominal muscles, it can be used to advantage, by picking up the intestine between the thumb and finger and rolling it gently from the stomach toward the rectum. In digital kneading with the finger tips on the mammary gland the palm of the left hand should support the breast, and the movement of the finger tips should be from the base towards the nipple. To excite uterine contractions in labor, kneading may be done by the palm of the hand describing a series of circles on the fundus of the organ, or the finger tips may be used in the same manner, and in like manner deep kneading of the colon by the finger tips is made pressing downward all the time, beginning at the rectum and working upward. This form of massage is useful in swellings, in joint sprains, in constipation, in indigestion, in engorgement of the liver, and in many other gland diseases. Action of kneading movements—irritant-stimulant—and tonic. It increases peristaltic motion of intestines, and hastens absorption of inflammatory products.

Of percussion movements there are four kinds. First, that done with the palm of the hand, letting the sides of the fingers touch each other, the operator then tapping the patient with quick, sharp blows with the wrist always flexible; the treatment should always be made from the centre towards the extremities, and either one or both hands may be used striking the body at the same time or alternately. Second, the hand being partly closed, the strokes are made with the dorsal surfaces of the closed fingers, using one hand and keeping the wrist flexible. This operation may be given with the patient standing or sitting, or in the recumbent posture. It is especially indicated in rheumatic conditions of the muscles of the back, in sciatica and neuralgia of the thigh, where there is weakness of nerve action, and in some troubles of the organs in the pelvic cavity, the uterus, rectum, bladder, etc.

Tapping is done with the tips of the fingers bringing them together so that they make the top of a cone, or with them open, in the latter case using a single finger or two, or all four, and the operation should be confined to the head and chest, using the fingers coned on masses of large muscles.

Beating with the ulnar borders of the hands should be made alternately with each hand, holding the fingers close together, the blow should be a light swift one, and is useful in massaging the back tissue or over the front of the thorax. On the back the movements must be from above downward ,one hand on each side of the spine, but not making the movements over the spine. This form of massage finds its field in cardiac affections, such as fatty heart and valve lesions, and on account of the importance of the organs diseased, must never be used unless under the attending physician's directions. Another method of giving this treatment is to open the fingers and hold them loosely, so that in making the stroke they fall together, and the force of the blow is made by the tips of the third and little fingers. The effect of these various movements is to excite the circulation, cause the muscles to contract, and at the same time it stimulates the nerve supply of the parts. It must be remembered that prolonged motion of this kind will finally cause a numbness in the nerves, and the operation should cease as soon as any tendency is shown of this occurring.

Stretching may be done on the whole of an extremity, the patient either sitting, standing or in a recumbent posture. If the arm is to be operated on, the wrist is grasped with both hands of the operator and traction is made in the direction of the long axis of the arm; the time the arm is on the stretch should vary somewhat, but it ought to be at least three minutes, then resting the arm for a few minutes when the operation may be repeated. In the leg the ankle is grasped by the palms of both hands, and traction exerted in the direction of the long axis of the leg. Stretching with the fingers is used on smaller tissue as the nerves, for instance the sciatic, which is sometimes operated on in this manner for the relief of neuralgia, etc. Stretching movements find their field in the treatment of fractures, sprains, ankylosis, "false" dislocations rheumatic joint affections. So far we have been occupied with a brief description of the different movements of massage and have given a few hints as to the application of this operation to the relief of pathological conditions. It will be necessary now to take up the study of anatomy so that we may be able to properly apply massage.

SKELETON.

The human body is made up of a number of different structures each of which has characteristics that are peculiarly its own, and which fits it for its particular work. The skeleton is the frame-work of the body, and serves to protect organs that are of delicate structure, to give shape to the body, to furnish levers which, when acted on by the muscles, become passive agents in motion, every movement of walking, or working at the various trades, of feeding, etc., is the result of the contraction of different bones, but as the two sides of the body have each the same number, there is only about one-half this number to describe. Bones are very hard, owing to their containing a large amount of earth matter; they are also very tough, because of the animal matter that they contain. The bones are of all sizes and shapes, and are classed as long, flat, short and irregular. Some idea of the strength of bone is obtained from the fact that it is twice as strong as oak and that a cubic inch is capable of sustaining a weight of 5000 pounds. The long bones are found in the extremities, and are described as having a shaft and two extremities; the flat bones are found in the head and in the trunk: the irregular ones are found in the trunk and in the extremities. The outer part of a bone is the hardest and is called the compact tissue of the bone. Bones are nourished by the blood-vessels that are found in the dense fibrous membrane "periosteum" that surrounds them, while the long bones have a canal in their interior "medullary" which is filled with material called "marrow," and this marrow has something to do with the development of the red blood corpuscles of the blood. There are numerous prominences and depressions on the surfaces of bones that serve as guides in locating certain tissues of the body, and also serve for the attachment of the muscles. It is essential that the person giving massage know these "landmarks" thoroughly, for they are the guides that will be called into use in every operation. A muscle is attached to this tuberosity, an artery runs in this groove, a nerve is situated between two muscles, etc., and you will need to refer to your anatomical text-book often, for these lectures cannot be made full enough to give every detail of anatomy. There are eight bones in the head, united to each other by what are called sutures, and between these bones there is no motion. The names of these bones are:—

Bones of the Face.

Occipital (1)
Parietal (2)
Temporal (2)
Frontal (1)
Ethmoid (1)
Sphenoid (1)
Nasal (2)
Lachrymal (2)
Malar (2)
Superior Maxillary (2)
Inferior Maxillary (1)
Palate (2)
Vomer (1)
Superior Tubinated (2)
Middle Tubinated (2)
Inferior Tubinated (2)

Bones of the Neck.

Cervical vertebrae (7)
Hyoid (1)

Bones of the Upper Extremity.

Clavicle (1)
Scapula (1)
Humerus (1)
Radius (1)
Ulna (1)
Cuneiform (1)
Pisiform (1)
Trapezium (1)
Trapezoid (1)
Os magnum (1)
Unciform (1)
Metacarpal (5)
Phalanges (14)

Bones of the Wrist and Hand.

Scaphoid (1)
Semilunar (1)
True ribs (14)
False ribs (6)
Floating ribs (4)
Sternum (1)

Bones of the Thorax.

Dorsal vertebrae (12)

Bones of the Lower Extremity.

Femur (1)
Patella (1)

Tibia (1)
Fibula (1)

Bones of the Ankle and Foot.

Os Calcis (1)
Astragalus (1)
Cuboid (1)
Schaphoid (1)
External Cuneiform (1)
Middle Cuneiform (1)
Internal Cuneiform (1)
Metatarsal (5)
Phalanges (14)

Bones of the Pelvis.

Os Innominata (2)
Sacrum (1)
Coccyx (1)

Where bones are joined together joints are formed.

Bones are developed in cartilage and some of them are not ossified until the age of man or womanhood. The calcareous matter that is deposited in the cartilage may commence at several points; these are called centres of ossification. After a certain period of growth these centres unite and bone is then completely formed. This fact has a practical bearing on the giving of massage and must always be borne in mind. The long bones have several of these centres of bone formation, usually one for the shaft of the bone and one for each extremity. There are then three separate pieces of the bone, and the ends are not joined to the shaft until adult life. Movements about the extremities of long bones in children, if too severe, or too prolonged, might cause a separation of the ends of the bones from the shaft, or on account of the ease with which the bones may be bent in young children, they might become misshapen. We have mentioned cartilage in speaking of bone growth. It is what is commonly called "gristle," and with its appearance all are familiar. It is tough, elastic and flexible; the temporary cartilages finally become bone; the permanent serve as a covering for the ends of bones, line the sockets or joints, form buffers between bony parts (the separate bones of the spinal column are separated from each other by cartilages, and between the ends of the bones forming the knee joint.) The ribs are joined to the breast bone by cartilages, "costal cartilages." It forms rims about joint sockets making them deeper, as seen in the shoulder and hip joints, and forms the frame-work of certain organs, as in the laryngeal cartilages, and the cartilages of the external ear. The surfaces of the cartilages are very smooth, and on this account joint motion is made easier, as there is less friction between the parts.

Articulations

Lecture No. 4

LIGAMENTS.

The ligaments are composed of white fibrous tissue, the fibres of which run parallel with each other, and are arranged in bundles. Ligaments are found in nearly all movable joints; they are flexible and allow of the freest motion, but are strong and tough and do not stretch. They serve the purpose of keeping the bones that form the joint in their proper place.

ARTICULATIONS (JOINTS.)

The different bones of the skeleton are connected together at differents parts of their surfaces, and these connections are the joints, some of which have no motion at all, some of which have only a limited motion, while others have the freest motion in every direction. The cranial bones are united by sutures and are immoveable, the skull being simply for the protection of the brain no motion is necessary. In the joints where there is limited motion, the parts are held together by strong and tough fibro-cartilages, as is the case in the spinal articulations, and that of the pelvic bones. Bone form the principal part of the joint; in the long bones it is the ends that make the articulations, and as these bones are located in the parts that require the most motion, the joints are constructed a little differently from the other joints. In the first place they are not held so close together; the ends of the bones are covered by cartilage, and are held together by strong capsules of fibrous tissue which is lined by a thin delicate membrane in the shape of a tube, attached by its open ends to the margins of the ends of the bones and secreting a thick, viscid substance looking like the white of an egg, which serves to keep the parts lubricated. The membrane is called the "synovial membrane" and the fluid it secretes the "synovia." It is seen that the joints require for normal motion the uniting of bones to each other by means of inextensible, flexible, tough tissue, and the providing with a material that will keep the parts well lubricated and allow of the different kinds of motion with the least possible friction. It will be with the moveable joint that the masseur will have most to do, and the different normal motions of these articulations must be familiar to the operator.

MOVEABLE ARTICULATIONS, "LIARTHROSIS."

There are a number of varieties of moveable articulations depending upon the kind of motion accomplished in moving the different parts of the joint.

The varieties of motion are four in number:

1—Arthrodia, gliding movement.

2—Ginglymus, hinge joint, forward and backward motion only.

3. Enarthrosis, movement in all directions.
4. Diarthrosis rotatoria, rotary movements.

An example of the first variety is found in the articulation of the clavicle (collar bone) with the breast bone (sternum), or at the other end where, it forms a sliding joint with the scapula (shoulder blade.)

A good example of a hinge joint is found in the elbow joint. Here there is considerable motion but it is only forward and backward, the ligaments being attached to the lateral borders of the bones prevents any other motion. The forward and backward movement of the forearm is called "flexion" and "extension." Extension is straightening the arm, while flexion is bringing the forearm to the body. In inflammatory conditions of this joint where there have been adhesions of the parts, it must be evident that any movements that are made for the purpose of breaking up these adhesions and restoring motion to the joint must be in the direction of flexion and extension. Any attempt at making any other movements would only be useless, and probably painful to the patient. Enarthrosis (ball and socket joint) permits motion in every direction. A good example of this variety is the hip joint. The head of the thigh bone forms the larger part of a sphere which fits into a socket (the acetabulum) formed in the innominate bone, the bony socket being made deeper by being bordered at its top by a ligament which fits closely to the head of the femur. Operating on this joint for a false ankylosis would require movements in every direction.

Diarthrosis rotatoria is simply the rotation of one bone forming a pivot-like process that fits in a ring; a good example of this joint is found where the head of the radius rotates in a ring formed partly by the ulna, and which is completed by a ligament. It is this joint that gives the motion of pronation and supination to the hand. The hand is prone when it lies with the palm on a table, and supine when it lies with its back on the same table. The ulna forms the lower portion of the elbow joint, while the radius at its lower end articulates with the wrist bones and is the upper bone of that joint.

We have seen the different motions in the several joints due to the way in which the joint was formed. Besides these we often hear others mentioned, and it is well to become familiar with them also.

Abduction is that movement that takes a part outwards, for instance, moving the thighs so as to bring the knees together would be **"adduction,"** while the movement taking the knees apart from each other would be **"abduction."** Circumduction is the rotating of the head of a long bone in its socket while the free extremity is made to circumscribe a cone-shaped space with the apex at the socket; grasp the ankle and make the extended leg describe as large a circle as possible and the movement of the head of the femur in the acetabulum is circumduction. It will be found in examining joint motions that some muscles pass over a joint to be inserted into the bones of another joint and this strengthens the articulation passed over, as it acts as a ligament to hold the parts together. Examine carefully the elbow joint on your own body, then examine the wrist joint; move the parts in different directions so as to become familiar with every motion that a normal joint is capable of. In this way you will be able to detect abnormalities of the articulations. In the carpus (wrist joint) and in the tarsus (ankle joint), the motion between the separate bones is very limited, but by using all the articulations of the joint at the same time a very considerable amount of motion is obtained, and the same is true regarding the separate bones that make up the spinal column, where motion between any two vertebrae is very slight, but the motion of the whole column is very great, and the movement is in any direction. Many of the tendons of muscles run through bony canals and are surrounded by a synovial covering for the purpose of lubrication. Inflammation of serous membranes is usually followed by adhesions of the parts. These adhesions may not cover the whole surface of the membrane, and, in such cases, measures are often used to break them up, and, as the synovial membrane is a serous membrane in structure, such disease will materially interfere with motion. Massage and movements here find a large field of usefulness, but it may require a long period of time to work a cure and patients must be prepared for this.

MUSCLES.

As we have seen the bones are the passive agents in motion. The structures that we will now study are the active agents in motion; a portion of them is called voluntary muscles because they are under the control of the will, the action being the result of volition. These are the muscles concerned in locomotion and the various movements of the body, and are attached by one or both extremities to bones. The involuntary muscles are those that have to do with organic life and act independently of our will, and are found in the walls of the intestines, stomach and in the walls of the bladder, and form the larger part of the heart, which is described as a hollow muscle. The muscle is the red meat of the animal; the lean meat and its physical properties must be familiar to any one. The most important property of muscles is their **contractility.** The contraction of a voluntary muscle is always followed by an interval of repose if the muscle is in a normal condition. There is a condition of muscular tissue called **muscular tonicity,** by which is meant a state of **passive activity,** where the muscle is acting without the influence of the will. An illustration of what this means is shown in the muscles that have for their function the elevating of the lower jaw; contact of the lower with the upper teeth is maintained by the tonicity of these muscles and without any effort of will. It is the normal, natural contraction of the muscles when not in a state of activity. Sometimes in place of the repose that should come to the muscle after its contraction, it remains contracted, does not relax its fibres, and the belly of the muscle shortens and remains so as long as the condition lasts. This is called **contracture,** and is an abnormal condition, which may be due to disease of the muscle, to some disease of the nervous system, to loss of antagonism, or to excessive use. Clinically considered this condition is of great importance. Stretching of a contractured muscle is easily accomplished and may be maintained and the cause of the contracture be removed. Contractured muscles are found in the curvatures of the spine, etc.

Muscles are easily affected by inflammation, the products of which infiltrate the tissue matting together the muscle fibres and thus interfering with its action. Anything that causes the muscle to be disused will, in like manner interfere with its action on account of its having become atrophied and having become the seat of a fatty deposit that has taken the place of the muscle fibre. Paralysis is followed by the same condition in the affected muscles. A judicious use of a muscle causes it to increase in size, while excessive use will be followed by a decrease.

Muscles that are connected to bones have what are called tendons for that purpose, and the most fixed insertion is called the origin, while the tendon inserted into the most moveable bone is called the insertion. A muscle in health can on account of its elasticity be stretched to a distance half of its length when at rest; a muscle 4 inches long can be stretched to 6 inches.

FUNCTIONS OF MUSCLES.

Some muscles form circular bands around the natural orifices of the body, and, on this account, they are called "sphincters" because they close the orifice, as the sphincter around the lower end of the rectum, and if the constricting action is suspended the muscle is said to be relaxed and the orifice dilated. Muscles are also termed "striped" because they are apparently marked with very fine dark lines that cross the fibres transversly and run parallel to each other. The striped muscles are the voluntary ones. The tendons of muscles are composed of dense fibres of white fibrous tissues and are not extensible. The portion between the tendons is called the belly of the muscle and is the part that contracts.

The Skin, Corpuscles, Glands, Muscles and Hair

Lecture No. 5

THE SKIN AND ITS APPENDAGES.

Massage cannot be given through the clothing; the hands of the operator must come in contact with the skin of the patient, and a knowledge of this structure and the functions that are performed by it, is of the utmost importance to the masseur. The skin is a firm, fibro-elastic membrane that encloses the whole body; its structure is very complex, and it has as appendages, the hair, nails, the sebaceous and sweat glands. By its situation it is exposed to temperature changes, and liable to injuries, disease and the ravages of the various pathological germs. It serves as a protection for the organs it covers; binds the muscles and fascia together; aids in giving shape to the individual, and prevents the too rapid escape of fluids from the body. It is an organ of general sensation, and also of the special sense of touch. It is also an important organ of excretion, of absorption and of secretion. From this statement of some of its functions, it will be seen that it is a structure that must be treated with great respect; careless handling might work great harm to this organ so essential to the welfare of the human animal. At the orifices of the mucous cavities it merges into the mucous membranes, so that the trunk of the human being is practically a tube, the outer covering of which is the skin, while the inner lining is the mucous membranes lining the alimentary tract. These are united to each other at the vermillion borders of the lips, and at the end of the rectum. Between these two coats are contained all the organs of the body. The skin is very elastic, and easily moved over the tissues that it covers; its thickness varies in different parts of the body, being very thin over the eyelids and the lips, while it is thick over the palms and soles.

A careful examination of the surface of the skin shows it to be marked by superficial furrows which are dotted by numerous depressions. These are the openings of the sweat ducts (pores) and the hair follicles and sebaceous glands (fat glands). An important function of the skin is the part it plays in the regulation of the temperature of the body. In a less degree the skin also acts as a respiratory organ giving off carbonic acid gas. Of importance to the masseur is the matter of the absorption of medicaments by the skin. It was for a long time disputed that medicines could be introduced into the system through the skin on account of the difficulty of passing liquids through the horny layer of the epidermis, but experiments have proved that there are certain medicines that can be introduced into the system in this way, and that their effect upon the ailment for which they may be used is identical with that produced if they are given by the mouth. Physicians make use of this way of medication when the stomach is not in a condition to receive medicines. Gases and watery vapors are easily absorbed, and thirst has been satisfied by immersing the body in water. Insoluble substances cannot be absorbed at all, and solutions in alcohol are only slightly absorbed, while fats and oils are readily taken up, and medicines incorporated with these pass probably through the skin glands, where they are acted on by their secretions and carried into the system. The important point in this connection is, that the absorption of medicinal substances through the skin is much hastened by friction and the masseur is the operator.

In considering the structure of the skin we say that it is made up of three layers:—

1—The Epidermis—or false skin—cuticle.
2—The Derma—or true skin—corium.
3—The Subcutaneous Connective Tissue.

The Epidermis is the external layer of the skin, and is made up of a number of layers of cells, each differing from the other, and called (naming them from the outside):—

1—The Stratum Corneum—horny layer.
2—Stratum Lucidum.
3—Stratum Granulosum, the layer in which the coloring matter is located.
4—The Stratum Mucosum, in contact with the true skin.

On the lower surface the epidermis has numerous elongations and depressions that fit into a similar surface on the corium, firmly interlacing with it. The different layers of cells of which the epidermis is composed are only loosely connected with each other, but the lower layer has numerous prolongations on the surface of the cells that firmly unite them to each other. This last is the growing layer of the epidermis. The horny layer is being constantly shed and as constantly replaced from the cells in the layers beneath it. This portion of the skin protects the parts beneath, and when this is removed, as it may be by a severe friction, the delicate nerves and the living portion of the skin are exposed, and an excoriation results that may end in a severe inflammation. This is to be remembered in any massage operation, and as individual skins vary in the ease with which this covering may be injured or removed, no rule can be given regarding the amount of friction or pressure that is to be used in every case. Each skin must be tested for itself, and it is better to think all cutaneous structures of most delicate build and to treat them accordingly. The skin is abundantly supplied with blood vessels. A rich plexus lies just under the papillary layer of the corium, and is intimately connected with another plexus that lies just below the corium. This richness of blood vessels is taken advantage of when it is desired to relieve the congestion of some internal organ, for the masseur by friction movements, by tapping movements, etc., causes a local congestion of the cutaneous structures, and in this way a drain is made upon the internal organ and it is relieved of a portion of its surplus blood. Always remember that the horny layer is the protector of the deeper layers of the skin, and aim to keep it intact. Specific poisons and the various germs that are pathogenic will not find entrance to the system unless there is a break in the skin through which they may enter. The skin is kept supple by the secretions of the glands that are located in it. The secretion is in the nature of a fat, and while it keeps the skin soft and supple, it also prevents the too rapid evaporation of moisture, and prevents the maceration of the tissues. If it were not for this fat on the skin, a prolonged immersion of the body in water would macerate it and make it soggy. As it is a certain amount of water passes into the circulation when a person is kept in the water for a long time. A few words regarding the different layers of the epidermis. On the outer surface of the horny layer the cells of which it is made are dried, lifeless and horn-like plates, lying in horizontal strata, becoming curled and wrinkled as they approach the surface, and the cells have lost their nuclei. This layer is also devoid of coloring matter except in the negro. The next layer, the stratum lucidum, is made up of only two or three rows of cells having no color and a glistening appearance that marks them clearly from the cell-layers above and below them. The next layer (stratum granulosum) consists of two, seldom more, rows of cells having shrunken nuclei, and containing roundish granules, which in the white race give to the layer the coloring matter. It is said to be the function of these granules to harden (cornify) the cells of the horny layer of the skin. The color of the skin in the white depends mostly upon the granular layer.

The most important layer of the epidermis is the one in contact with the true skin, and is called "stratum mucosum" or "rete mucosum." As we have seen the corium, and this layer of the epidermis are interlocked with each other by interdigitations. This interlocking prevents friction between the two structures, and increases the amount of blood supply. As the prolongations of the derma have a vascular plexus in each of its papillae, and as the epidermis has no blood vessels it has to depend upon the derma for its nourishment, which it gets from the vascular supply of the corium. The stratum mucosum is made up of a number of rows of cells which are masses of living matter united to each other by a system of fine threads running in all directions, the whole forming a network that envelops the whole body, and lines the cavities and canals that are connected with the surface. This network is imbedded in a substance that separates the cells from each other, and through this are numerous channels for the fluids which carry the nutrition to the cells. Where the threads meet in passing through the cells, is what is called "nucleus." The threads and the nucleus are the living matter of this layer. The cells are called "epithelia." No blood vessels penetrate the epidermis, nor are there lymph vessels, but there are numerous nerves which traverse the spaces between the cells which they finally penetrate and they are closely connected with the living matter of the cell. The living layer of the cuticle plays a very important part in all physiological and pathological processes of the skin, as it is probable that in the embryo it forms all the appendages of the skin, and furnishes in health and disease all the organic matter of the secretions.

The Corium lies directly under the epidermis and is made up principally of bundles of fibres of connective tissue forming a dense network which is surrounded by a cement substance, which holds the various elements of the skin together. The derma is rich in blood vessels, and contains many nerves. It also has muscle fibres, hairs and sebaceous glands (fat glands). It varies in thickness in different parts of the body, being thicker over the back, the buttocks and on the palms and soles, while it is very thin on the eyelids and on the inner faces of the labia majora and prepuce.

There are two layers of the derma—"the papillary layer," composed of the prolongations that enter the epidermis, and the "reticular layer," formed by the interlacing of the bundles of fibres lower down, and finally ending in the subcutaneous tissue beneath. The papillae are simply a bundle of connective tissue fibres which do not interlace with others, the whole bundle being surrounded by the threads of the living matter found in the lower layer of the epidermis. These papillae differ in size and shape in different parts of the skin. There are two varieties of papillae, "the nerves," which contain the terminations of medullated nerves, and the "vascular," which contain the endings of a small artery and vein. The vascular papillae are much more numerous than the nervous. It is probable that this distribution of blood is for the purpose of aiding in cooling the blood, by bringing it in such large quantities to the surface of the body. Of course, it furnishes nourishment to the epidermis at the same time.

The Pacinian Corpuscles are situated in the subcutaneaus tissues and are made up of a number of capsules resembling the onion in their arrangement, and are connected with a medullated nerve, and from their situation in greater numbers in the subcutaneous tissue of the nipple, the penis, the ends of the fingers, etc., are supposed to have some connection with the tactile sense.

TACTILE CORPUSCLES.

In one out of every four of the papillae of the derma is found a peculiar nerve ending to which the above name has been given, and for a long time it was thought that these bodies were the organs of the special sense of touch, but, as we have seen that there are nerve endings even in the epidermis, which from its location must be the first to come into contact with bodies, we are obliged to give to each of these different nerves something to do with the sense of touch, and it may be that one has to do with impressions of pressure; while another wih such impressions as heat, cold, etc.; while others may have to do with the pains of an injury. Beside these nerves are found what are called "touch cells" and "bulb corpuscles." All these different nerves are found in the skin or in the subcutaneous tissue, and show how rich in nerve supply the skin is.

SKIN MUSCLES.

From the subcutaneous tissue to the skin in some parts of the body are striated muscle fibres, principally about the neck and face, and here they are used to give expression to the various emotions. The non-striated muscles of the skin are connected with the glands and follicles of the skin, or as bands forming rings, as those encircling the nipple. One set of the fibres is connected with the hair follicles in such a manner that the fat gland will be compressed with every contraction of the muscle, and aid in the expulsion of its contents. These muscles by their contraction produce that familiar condition called "goose flesh," and by pressing out the blood contained in the vessels of the papillae, prevent its getting the cooling effect produced when it comes to the surface of the skin. When the hairs stand on end these muscles are the cause of the condition.

HAIRS.

Hairs are elongated epithelial structyures derived from the epidermis, and planted obliquely in the true skin. They are found everywhere on the skin excepting upon the palms and soles, on the penis, and the backs of the last joints of the fingers and toes. At the roots of the hairs, and in the coats of the hair follicles are nerve endings which in certain conditions are exceedingly sensitive. It must always be remembered that there is one way in which the hair may be stroked, and the sensation will be one of pleasure to the patient, and the operation will have a soothing effect, but stroked in the other direction the sensation will be disagreeable and exceedingly annoying to the patient. The explanation of this is easily seen when we remember that these structures are not set in the skin at right angles to its surface, but obliquely, and rubbing in one direction is virtually endeavoring to push them deeper into their socket, and the delicate nerve endings are irritated, while the other motion simply lays the hair down upon the skin in the direction of its growth. Many of these points may seem very simple, but it is attention to the little things that enables us to accomplish the most.

SEBACEOUS GLANDS (FAT GLANDS.)

These glands are situated in the corium, and their secretion serves a number of functions; one of which, and probably the principal one, is the oiling of the hairs. As the contents of the glands connected with the hairs are emptied into the hair follicle, the shaft of the hair is pushed through the oily secretion. Another function seems to be the secretion of products that have a certain odor which acts in some cases as a preventive to insect ravages, as, for instance, the secretion of the fat glands of the external ear. It is not probable that these glands have much to do with keeping the skin supple, as this seems to be the function of the coil part of the sweat glands.

The Blood and Lymphatic System
Lecture No. 6

The Coil glands are situated in the subcutaneous tissue and are convoluted tubes ending in a blind pouch; they are lined with epithelia, which are the secreting cells of the gland. An idea of the importance of these glands is found in their number (between two and three million) and the fact, that if they were uncoiled and laid end to end they would reach a distance of about eight miles. The duct of the gland runs to the bottom of the epidermal layer, and ends in the **sweat pore,** which is nothing more than a walless canal running through the epidermis. The secretion of the gland proper is principally fat which is for the lubrication of the skin. The sweat or watery portion that comes to the surface of the body is probably from the epidermis where, on account of the pore not having a wall, the contents of the juice spaces of this tissue may reach the pore and be thrown on the surface of the body. Ninety-eight per cent. of the sweat is water. This secretion at times contains effete material that is usually eliminated by other organs. The contraction of the little hair muscles interfere with the expulsion of the contents of the coil glands, while aiding that of the sebaceous glands. Now this complex structure (with its manifold functions that are so necessary to life that, if a large part of its surface is destroyed or rendered unfit to accomplish its functions, death will result), is the organ that the masseur has the most to do with. It will oftentimes be found that on examination before beginning an operation that this structure is very harsh and dry, and that it is evidently suffering from lack of its natural unguent, and in such cases it becomes necessary to use some bland unguent on the surface, but only a very little should be used as the operation will, in a short time, force the contents from the glands that furnish the natural unguent for the skin. Skins that are very hairy require also application of fat when being massaged. There is a prejudice against the use of mineral fats, such as vaseline, under the impression that their use tends to stimulate a growth of hair, and in massaging the face it is well to use some animal or vegetable fat instead. There are a great many "skin foods" advertised for the removal of face wrinkles and the development of lax skins, but they are of little value: the merit of their use being simply the massage, which in the hands of a skilful operator is capable of removing these blemishes to a large extent. The wrinkles are the result of relaxed or atrophoid muscles, and as we have seen that the use of a muscle tends to develop it, the scientific masseur will be able to stimulate into action the relaxed muscle and develop the atrophied one. Of all the preparations that may be used in connection with massage for restoration of a skin to its original plumpness, lanolin is the only one that is of much value. That fat is probably more easily absorbed into the skin than any other fat, is not the least irritating to the most delicate skin, and this is a matter of some importance, as vaseline and other fats are in some cases very irritating. Any fat that is to be used on the skin must be free from any rancidity, and rendered perfectly antiseptic. After massage in which any fat has been used, the excess of oily matter remaining must be removed, and this can be accomplished without the use of soap and water, by using absorbent cotton and rubbing the surface carefully with it. The cotton absorbs the oily matter and little friction is necessary to remove the excess of fat. It is to be understood that in these directions regarding the use of fat, that we are not discussing conditions that are requiring stimulation, for in these cases it is necessary to irritate the skin, and in general, unless there are special reasons for the use of a lubricant it had better be avoided. There is nothing so agreeable to a patient's skin, nothing so soothing, as the soft hand of the masseur applied scientifically to the cutaneous tissues of the sufferer.

THE VASCULAR SYSTEM.

In order that the body may be nourished in every part, that material may be supplied for its growth, and for repairing waste that is constantly occurring as a result of the using of the different organs of which it is composed, it is necessary that some means be at nand by which the nourishment is carried to the different tissues. It is also necessary that the waste products that are the result of any action of muscle, or organ secretion or excretion, should be thrown out of the system entirely, and there are also valves between the auricles and vessels that empty in them.

The blood is the life giving fluid which permeates every part of the body, except the cuticle hair and nails. Through the corpuscles food is carried to the tissues, nature arranging to get rid of all refuse through proper channels. Arrangements are provided for converting the various food stuffs into blood and such material as cannot be assimilated and converted into actual body building is thrown away. The principal excrementitious fluids discharged from the body are the urine, perspiration, and bile; they hold in solution principles of waste which are generated during the activity of the nutritive process and are the ultimate forms to which the organic constituents are reduced in the body. The urinary apparatus consists of the Kidneys, Ureters and Bladder. The Liver is made up of a large number of small bodies called lobules and this complex organ has a variety of relations to the general processes of the body. While the physiological functions of the liver are not yet fully understood it may be said that it

1—Secretes bile.

2—Forms glycogen.

3—Assists in forming urea and allied products.

4—Modifies the composition of the blood as it passes through it.

The skin is the external investment of the body and serves as a protective covering, as an organ for tactile sensibility and as an organ for the elmination of excrementitious matter

The metabolism of the body generally, as well as that of individual organs, has been shown to be related not only to the physiologic activity of such organs as the Liver and Pancreas, but also to the activity of the so-called vascular or ductless glands. The influence of the pancreas in regulating the production of glycogen by the Liver, and the influence of the Liver in the maintenance of the general metabolism through the production of glycogen and the formation of urea, are now established facts. That the vascular or ductless glands to an equal extent, though perhaps in a different way, assist in the maintenance of physiologic processes, appears certain from the results of animal experimentation. The explanation given, and generally accepted at the present time, for the influence of these glands is that they produce specific substances, which are poured into the blood or lymph and carried direct to the tissues, to the activities of which they appear to be essential, for without these substances the nutrition of the tissues declines and in a short time a fatal termination ensues.

Inasmuch as these partly unknown substances are formed by cell activity and are poured into the interstices of the tissues, they have been termed "Internal Secretions." Though the term internal secretions is applicable to all substances which arise in consequence of tissue metabolism, and which, after being poured into the blood, influence in varying degrees and ways physiological processes, yet the term in this connection will be applied only to the secretions of the thyroid gland, hypophysis cerebri, and adrenal bodies.

It is evident that the presence of the thyroid is essential to the normal activity of the tissues generally. The view that the gland removes from the blood certain toxic bodies, rendering them innocuous and thus preserving the body from a species of auto-intoxication, is gradually yielding to the more probable view that the epithelium is engaged in the secretion of a specific material, which finds its way into the blood or lymph and in some unknown way influences favorably tissue metabolism.

The material secreted by the hypophysis cerebri has not been isolated, hence its chemical features are unknown. After its formation it probably passes through a system of ducts into the cerebrospinal fluid, after which it influences the metabolism of the nervous and oseous tissues as well as the force of the heart muscle.

From experiments it is evident that the adrenal bodies are engaged in elaborating and pouring into the blood a specific material which stimulates to increased activity the muscle-fibres of the heart and arteries, and thus assists in maintaining the normal blood pressure as well as the tonicity of the skeletal muscles. It has been clearly demonstrated that massage is of inestimable value in treating the entire vascular system and stimulating it to a performance of its normal and natural function.

THE CIRCULATION.

The circulation is carried on by means of the Heart, Arteries, Capillaries and Veins. The Heart beating about 70 per minute, alternately receives blood from the Venous System, and discharges it into the pulmonary artery and aorta. Arteries, with elastic and muscular walls, form channels for the blood to the system, assist the heart in maintaining the circulation, and regulate the supply of blood to different parts. The Capillaries are canals of minute calibre with thin permeable elastic walls, allowing both liquor sanguinis and white corpuscles to pass through their walls into the surrounding tissues. The Veins forming channels of return to the Heart are provided with muscular walls and valves and are sufficiently capacious to hold the total blood of the body. The Heart consists of four chambers with contractile walls, situated in the Chest, and surrounded by a fibro-serous sac (the pericardium) in which it works. In form the heart resembles a cone, its base directed upwards, backwards and to the right, its apex downwards, forwards and to the left. Its Apex-beat is felt at the fifth intercostal space, two inches below the nipple, and one to the inner side of the left nipple line. The Heart contains four chambers, two Auricles and two Ventricles. The right Ventricle forms the right border and chief part of the anterior surface of the heart. The left Auricle is situated at the posterior part of the base of the heart. The left Ventricle forms the left margin of the heart, the greater part of the posterior, and a small part of the anterior surface. The Endocardium is the membrane lining of the heart and closely resembles the membrane lining of the Arteries. The Valves are situated at the Auriculo-Ventricular Orifices, and prevent the passage of blood into the Auricles during the Ventricular Systole. They consist of flaps or cusps, two in the Mitral, and three in the triscuspid. They are formed of a duplicature of the lining membrane of the heart strengthened by connective tissue.

As the auricles simply have to force the blood into the ventricles they are only thin walled, while the ventricles, having to force the blood through the lungs to the most distant part of the body have very thick walls. As the blood is forced out of the ventricles into the aorta and pulmonary artery, its return is prevented by the closure of the valves of these vessels at their openings into the ventricles. The circulation of the blood is in a circle starting from the left ventricle it is forced through every part of the system, and then passing through the capillaries into the veins it is returned to the lungs, and then into the left auricle and ventricle. The pulsations of the heart are the contractions of its muscles, and these contractions occur in the healthy adult between 65 and 75 times a minute; the pulsations are more frequent in children. Some idea of the amount of work that is required of this little organ may be gained by the knowledge that each pulsation sends two ounces of blood into the pulmonary and systematic circulation respectively and this is repeated on the average at least sixty times a minute during the twenty-four hours. The cavities of the heart have two openings, which are closed by valves that open and shut alternately during the filling and emptying of the cavities. It is absolutely necessary to the health of the individual that the valves of the heart are perfectly normal, and anything that will interfere with their accurately closing will allow of the blood being forced backward (regurgitation), instead of in its normal course. The heart is the principal agent in propelling the blood through the vessels, but it is not the sole agent. The arteries have thick, elastic walls made up of three coats, an outer one made of connective tissue, a middle coat of muscular and elastic tissue, and an inner coat of fibrous and elastic tissue, and on account of their structure they are both contractile and elastic. The veins have three coats, like the arteries, but are thinner, less elastic, and when emptied, colorless. They have valves at intervals to prevent the backward flow of blood. These valves, distributed throughout the course of the veins are arranged in pairs and formed by the reflection of the internal coat, strengthened by in-fibrous tissue. They always look towards the heart, and when closed prevent the reflux of blood in the veins. Pressue made upon the vein in any part of its course interferes with the circulation, and when continued long disistrous results are bound to follow. The free edges of the valves all point toward the heart, and pressue made upon a vein in any part of its course will force the blood and disastrous results will follow. Massage of these cases must never be undertaken unless by the direction of a physician. The capillaries are the finest divisions of the arteries and veins. They are very small cylindrical tubes composed of a single layer of endothelium. They inosculate freely with each other, forming a fine network, the meshes of which are finer in the most vascular organs, as the lungs, for instance, wherein the meshes are smaller than the vessels themselves. As a rule, the more active function an organ possesses, the greater its vascular supply. All the organs and tissues of the body are supplied with capillaries, from which they derive their nourishment, by its transuding through the thin walls of the vessels, and the carbonic acid gas and other products of the different organs are sucked up into the venous capillaries and carried to the lungs for oxidation. The blood current in the capillaries is much slower than in the arteries or veins. In most parts of the body the arteries pursue a straight course. In the veins there is about twice the amount of blood that there is in the arterial system. Passive movements of the body have an influence upon the blood current; grasp the wrist and make extreme extension and flexion of the elbow joint and you will find that at the extreme limit of motion in each movement the flexor and extensor muscles are put on the stretch, and this stretching of the muscle fibre brings them closer together and squeezes the blood vessels that are in these tissues forcing the blood onward. Make these movements active and their action becomes much greater in forcing the blood out of the vessels. Friction and beating movements of massage over the muscles cause them to contract and the same effect is produced.

LYMPHATIC SYSTEM.

The lymphatic system of vessels must be considered as a part of the vascular apparatus, because the contents of its vessels are poured into the great veins, and become a part of the blood. The lymphatics are named from the appearance of the fluid they contain (lympha water). They are also called absorbents, because they pick up certain materials from the tissues and carry them to the circulation. The lymphatic system is made up of capillaries, vessels, glands and the thoracic and right lymphatic ducts. The lymphatic vessels begin in a fine network in the subcutaneous tissue, while in the interior of the body they lie in the submucous tissue of the whole alimentary tract, the pulmonary tract, the genitourinary tract, and the subserous tissue of all the serous membranes of the abdominal, the thoracic, and the cranial cavities. These are the superficial lymphatics; the deep vessels are fewer in number and larger, and accompany the deep blood vessels. Lymph spaces exist in the meshes of the connective tissue, and in the tissues that are not supplied with arteries the nourishment is derived from the lymph flowing in these spaces. The lymph vessels are thin walled and supplied with valves like the veins, and are marked at intervals by dilatations which give them a beaded appearance. In cases of inflammation of the lymphatic vessels these appearances are rapidly seen or felt as hard cords, knotted at short intervals. In the course of the lymph vessels from their origin to the time that they enter the thoracic and lymph ducts, there are numerous oval or bean-shaped bodies varying in size from hemp seed to an almond. These are the lymph glands, and as the vessels enter them they divide into numerous capillary tubes penetrating the gland in every direction, and uniting to leave the gland as a single vessel again. These glands are found in the neck, in the axillae, at the front of the elbow, in the groin, and popiteal space, and, in these situations, can be felt whenever they become infected. Large numbers of these glands are found in the abdominal cavity, in the messentery, and in connection with the large blood vessels. The lacteals which are the lymph vessels of the alimentary tract, pick up the digested food and empty it into the thoracic duct which in turn empties into the left subclavian vein at its junction with the internal jugular. The lymphatics of the right side of the head and neck, the right side of the thorax, the right upper extremity, right side of heart, the right lung, and the convex surface of the liver, empty into the right subclavian vein through the right lymphatic duct. The lymphatic vessels do not carry nourishment to the tissues, but as the food material has been thrown out of the capillaries and the tissues are bathed in it, and, as there is often more than is needed, the lymphatics pick this up, and at the same time pick up whatever waste material there is in the part, and this is all thrown into the blood current; some to be used again and the balance to be carried to the various organs of excretion. The lacteals already mentioned are net works of lymphatic capillaries forming small projections which push out the mucous membrance of the small intestine; these are called **villi** and they are bathed in the digested food that is passing through the intestine and are taking it up to pass it into the circulation. This fluid is called the **chyle**, and during digestion it has a milky appearance from the fat it contains. As the tissues are all bathed in this lymph, it is readily seen that the various massage movements must have an influence upon its flow, and, as the lymph vessels are provided with valves, the flow must be in one direction only. Muscular contractions must also force the lymph out of the lymph spaces. Percussion and kneading of muscles produces contraction.

Nerves, Brain and Spine

Lecture No. 7

THE NERVOUS SYSTEM.

Every tissue of the body depends upon the nervous system for its maintenance at the normal standard of health. Every tissue or organ is connected to the great nervous centre by fine filaments of nervous tissue called nerves. There are two great divisions or nervous systems in the body. These are called the cerebro-spinal and the sympathetic. The cerebro-spinal is composed of a set of large centres of nerve matter called the **cerebro-spinal axis**, a number of smaller centres called **ganglia**, certain structures called **nerves** that are connected with the cerebro-spinal axis, or the ganglia, and certain modifications of the terminal endings of these nerves as they are distributed to the different tissues or organs by which they form the organs of special sense. The cerebro-spinal centre is made up of two parts: -

1—The spinal cord.

2—The brain, which consists of the cerebrum, cerebellum, pons varolii and the medulla oblongata.

The brain is that portion of the cerebro-spinal axis that is contained in the skull cavity, and as we have stated is divided into four parts.

THE CEREBRUM.

The cerebrum forms much the largest part of the brain; it rests on the base of the skull in its anterior and middle fossae, and is separated from the little brain (which it covers) by a fibrous membrane, the **tentorium cerebelli.** At the middle of its under surface is constricted portion that passes down to be continuous with the spinal cord, while another portion passes down into the cerebellum.

THE CEREBELLUM.

The cerebellum or little brain lies beneath the cerebrum at its posterior part and separated from it by the tentorium, while its under surface rests in the occipital fossae. It is connected to the cerebrum as already stated, and by similar portions to the medulla oblongata below, while two portions meet in front to form the pons varolii.

THE PONS VAROLII.

The pons varolii rests upon the basilar surface of the sphenoid bone at the base of the skull and is made up of the various portions that come from the cerebrum and cerebellum, and is connected with the medulla oblongata below, forming the bond of union with these different structures.

The medulla oblongata is the connecting link between the pons above, and the spinal cord below and lies on the basilar surface of the occipital bone. The size of the brain bears a relation to the intellectual capacity of the individual. Cuvier's brain weighed 64 ounces, while the brain of an idiot will weigh about 23 ounces.

THE CEREBRUM

The cerebrum is divided into two portions by the great longitudinal fissure which extends throughout the entire length of the organ down to its base. These two parts are called the hemispheres of the brain, and are connected at the base of the broad band of white matter, **the corpus callosum.** The surface of the cerebrum is rough, convoluted and separated by deep fissures. The convolutions have for their outer surface gray nervous matter, which, on account of the convolutions covers a much larger surface than it would if the surface of the brain were perfectly smooth. The number of convolutions in brains seems to bear a relation to the intellectual capacity of the individual. The cerebrum is the seat of emotion, will, intelligence and sensation. Nervous impulses and impressions originate in the gray matter, while the white matter conducts them. The gray matter of the cerebrum forms its essential constituent.

THE CEREBELLUM.

The cerebellum also consists of two hemispheres divided by a deep notch with the surface thrown into layers, and has gray matter for its external coat, and white matter inside layers the same as the cerebrum. The function of the cerebellum has to do with the co-ordination of movements. Injury of this organ will prevent locomotion, and the body cannot be balanced; but this is, in many instances, only a temporary loss of co-ordinating power, recovery occurring after a certain time. As a person is able to move voluntary muscles while suffering from disease or injury to this organ, but cannot cause the muscles to act together, as is necessary for the purpose of locomotion, it is evident that voluntary movements do not originate in the cerebellum.

MEDULLA OBLONGATA.

The medulla contains important centres which govern involuntary movements. Disease or injury of this organ interferes with the function of respiration, swallowing, etc., and if serious, death will result. The gray matter of the medulla is at the centre not on the outside, as it is in the cerebrum.

THE SPINAL CORD.

Beginning at the lower border of the medulla, and running through the whole length of the vertebral canal to the lower border of the body of the first lumbar vertebrae, is the spinal cord. It is very much smaller than the canal that holds it, on account of which it is protected from injuries that might occur from the motion of the parts, etc. The vertebral column is made up of a number of separate bones placed one above the other and extending from the occipital bone to the top of the coccyx. In the cervical region there are seven vertebrae, in the dorsal region there are twelve, and in the lumbar region there are five. The sacrum consisting originally of five separate bones is united into one bone in the adult.

and the four bones of the coccyx also become one in the adult. The vertebrae above the sacrum are composed of a body in front, and from the sides of which springs a flat piece of bone that curves back to meet one from the opposite side, and the two unite to form the vertebral canal in which lies the spinal cord. From the point of union of these laminae springs the spinal processes of the vertebrae. The bodies are separated from each other by elastic cushions, and the shapes of the bodies and of these cushions vary so that the whole column makes a number of prominent curves from before backward, while there are no lateral curves. The spinous processes are easily felt in the median line on the back, and should form a straight line from the neck down. Diseases of the vertebrae result in curvatures of the spine producing marked deformity. The spinous processes and the transverse processes are for the attachment of the muscles of the back. The ribs articulate with the vertebrae. Notches are left between the vertebrae for the passage of the spinal nerves out of the spinal canal. The spinal cord tapers to a point at its lower end, and then splits up into a number of fibrous cords (cauda equina.) The cord is divided into two portions by fissures which form a right and a left half of the structure. The cord is made up of two portions, a gray matter which is in the centre of the cord, while the white portion is on the outside. There are two prominent swellings of the cord, one in the cervical region, from which are given off the nerves that go to supply the upper extremities, and one in the lumbar region, from which are derived the nerves that supply the lower extremities. The two lateral columns of the cord are divided by a fissure in front from which come the anterior roots of the spinal nerves, and another fissure posteriorly from which come the posterior roots.

Another fissure exists close to the posterior. By these fissures the cord is divided into four columns on each side.

BRAIN AND CORD COVERINGS.

The dura mater is a firm inelastic membrane that lines the inner surface of the skull bones and is firmly attached to them. It sends prolongations inward that support portions of the brain, and furnishes a fibrous covering for the nerves as they leave the skull, and extends down the vertebral canal as a loose sac enveloping the spinal cord. It is not attached to the bones in the spinal canal.

THE ARACHNOID MEMBRANE.

This membrane is a delicate structure which envelopes the brain and is continuous with the same membrane, covering the spinal cord. Between it and the pia mater is an abundant secretion—the cerebrospinal fluid—so that the brain and cord are surrounded by a fluid which serves to protect these parts from the shock of concussions. It also covers the nerves as far as their exit from the skull.

THE PIA MATER.

Is a vascular membrane that covers the brain and spinal cord, and dips down into all the sulci, and covers the nerves to their exit from the bony canals. It is from this membrane that cord and brain derive their nourishment.

CRANIAL NERVES.

There are nine pairs of cranial nerves:

1—Olfactory
2—Optic
3—Motor ocu.
4—Path
5—Trifacial
6—Abducen.
7—Facial (portio dura)
Auditory (portio mollis)
8—Glosso-pharyngeal
Pneumogastric
Spinal accessory
9—Hypoglossal.

These nerves arise in pairs, one for each side, and they are further divided into several groups:—

1—Nerves of special sense. 2—Nerves of motion. 3—Mixed nerves. 4—Nerves of common sensation.

Each of these nerves arises from some portion of the brain. There are special portions of the brain that control certain functions of the body, and we are able to locate pathological conditions of the brain and spinal cord by the occurrence of symptoms at different parts of the body to which nerves are distributed that have their origin in that portion of the cord or brain that may be diseased.

The nerves of special sense are:—

1—Olfactory—sense of smell, distributed to the mucous membrane of nose.

2—Optic—sense of sight, distributed to the retina.

3—Auditory—sense of hearing, distributed to the internal ear.

4—Part of glosso-pharyngeal—sense of taste, distributed to the mucous membrane at the base of the tongue.

5—Lingual (branch of the fourth)—sense of taste, distributed to the papillae and mucous membrane of the tongue.

The nerves of common sensation are the fifth and part of the glosso-pharyngeal. The fifth is distributed to the integument of the face, and the mucous lining of the mouth and pharynx, and to the teeth of both jaws.

It is well to be familiar with the distribution of the nerves of the face and head, to know where they emerge from the skull, and their course through the tissues, and we will call attention to some of the more important ones.

The motor nerves of the eye-ball are so deeply seated that it would be difficult to reach them for massage operations.

The fifth nerve is the one that is so often the seat of severe neuralgic pains and the different movements, and massage is often of much benefit in these cases. This is the largest cranial nerve, and like the spinal nerves it has a ganglia on its posterior root. It also arises by two roots like the spinal nerves. The ganglion is called the (Casserian) and in intractable cases of neuralgia it is removed. The first branch of the fifth nerve the "ophthalmic" sends a branch (the supra-orbital) through the supra-orbital notch at the inner border of the eye-brow; it gives off branches to the upper eye-lid, and ascends to the forehead and terminates in branches that supply the skin of the head as far back as the occiput, and it also supplies the muscles of these parts with sensation. Pressure on this nerve as it leaves the supra-orbital notch, and the following of the branches over the forehead often gives relief. This motion had better be applied with the ball of the thumb, and followed by friction starting at the middle of the forehead, passing to the temple, and followed by effleurage in the opposite direction following the course of the veins.

At the lower and inner border of the orbit is the infra-orbital canal—the notch can easily be felt; through this the superior maxillary nerve (the second branch of the fifth) emerges and is distributed to the side of the nose, the upper lip and lower eyelid. Another branch is distributed to the skin of the temporal region, and forehead; massage of this nerve would be at its exit, over the forehead, or from the angle of the jaw to the middle of the mouth. The inferior branch of the fifth is distributed to the teeth and gums of the lower jaw, the integument of the external ear and the temple, the lower part of the face, and the lower lip, but is too deeply seated to be reached for massage of its trunk. This nerve sends a branch to the tongue as a nerve of special sense of taste.

The Pneumogastric nerve is a very important nerve, and supplies the organs of voice with both motion and sensation. It also controls respiration, and is the motor nerve of the heart, stomach, pharynx and oesophagus.

THE SPINAL NERVES.

These nerves arise by two roots in the spinal cord; the anterior root is the motor root, and the posterior, the sensory root. These nerves arise in pairs of which there are thirty-one; 8 in the cervical region; 12 in the dorsal; 5 in the lumbar; 5 in the sacral, and 5 in the coccygeal region. The fibres of both roots run in different directions after entering the gray matter of the cord—some ascend, some descend, and some cross to the opposite side. Just before the two roots unite, the posterior has a ganglion attached to it. The union of the two roots forms a short trunk that passes out of the canal through the intervertebral notch, and then divides into an anterior and posterior branch. The anterior branches supply the limbs and the parts in front of the spine, while the posterior branches supply the parts back of the spine. The nerves all contain fibres from both roots. At certain parts the nerves unite to form plexuses, the fibres of a number of nerves intermingling.

The cervical plexus is formed by the anterior divisions of the four upper cervical nerves. The brachial plexus is formed from the anterior divisions of the four lower cervical and the first dorsal nerves. The lumbar plexus by the anterior divisions of the four upper lumbar nerves; the sacral from the three upper sacral, and a part of the fourth; and from the cord below the lumbar plexus. From these plexuses branches are sent to all the muscles and the skin in front of the spine. Sensation is furnished and motion by the same nerve.

Nervous System and Paralysis
Lecture No. 8

THE SYMPATHETIC NERVOUS SYSTEM.

The sympathetic nerve consists of a series of ganglia connected with one another by cords of nervous matter, and extending on either side of the spinal column from its junction with the cranial bones to the coccyx. It also extends into the head, where its ganglia are connected with one only of the cranial nerves—the fifth. The two cords forming this system join together on the front of the coccyx. They are also probably united at their upper extremity, and have numerous connections along their whole course. Along the course of the cords, on either side of the vertebral column, are ganglia, each of which is a distinct nerve centre: branches run from these ganglia in three different directions:-

1—Branches to other ganglia.
2—Branches to the cerebro-spinal nerves.
3—Branches to the viscera and blood vessels.

In connection with branches from the cerebro-spinal nerves, plexuses are formed about the heart, stomach and lungs, and in part control the functions of the different organs. One of the important functions of the sympathetic nerve is the regulating of the blood supply to a part; this set of nerves is called the vaso-motor system, and its function is to dilate or constrict the calibre of the vascular canals. The vaso-constrictors acting, will retard the flow of blood through the arteries. This will be observed in the turning pale under the influence of fear or anger, while the vaso-dilators will cause the arteries to dilate, allowing more blood to pass through [illegible] and emotion, such as pleasure or shame, will result in blushing. [illegible] are three large and important plexuses of the sympathetic system, they are named: -

1—The cardiac plexus.
2—The solar plexus.
3—The hypogastric plexus.

The cardiac plexus is behind the arch of the aorta, and its branches are distributed to the heart principally.

The solar plexus is behind the stomach and supplies all the viscera in the abdominal cavity. The hypogastric plexus supplies all the organs in the pelvic cavity. This system of nerves is supposed to influence the organs through the reflex act. By a reflex act is meant that an irritation at one point of the body, by means of the sympathetic nerve makes a manifestation at some part of the organism that is remote from the site of irritation. An example of this is seen in the convulsions of young children as a result of the ingestion of food that is indigestable. Then again nausea and vomiting are often the result of the pregnant condition, and exposures of the skin to extremes of cold or wet will be followed by an attack of diarrhoea. Many other instances will occur to you of reflex actions. An evidence of the importance of this system, is the fact of sudden death occurring after even a slight blow over the region of the solar plexus. Pugilists are barred from striking below the belt for fear of this injury to the solar plexus. Interference with the function of this system must necessarily affect the blood supply of the different structures, ending in the effusion into the tissues of the watery portions of the blood, causing dropsy on the one hand, or, where the blood supply may not equal the normal amount required for the nourishment of the tissues, an atrophy may be the result. In either of these conditions the benefits of massage and movement are apparent; they will assist the movement of the blood current, stimulating an extra supply to the atrophied tissue, or in the other case picking up the effused portions of the vascular fluid that has escaped from the blood vessels. There are many affections of the nervous system that are benefited by the use of mechano-therapy, and if we are not able to directly benefit the nervous structure itself, we may be able to overcome some of its effects in other organs of the body.

We will now take up some of the diseases that are to come under the care of the mechano-therapist, and will begin with those of children, and take up the affections that are the result of nervous diseases in remote organs, or of the structure of the nervous system itself.

INFANTILE PARALYSIS.

This affection so often begins without attracting much attention from either parents or nurses, that it is well to be familiar with some of its early symptoms, as much can be accomplished in the way of cure, if the affection is recognized early and treated properly. Massage and movements are prime factors in helping to overcome the disorder. The disease is caused by a destruction of nerve cells and the anterior horns of the spinal cord, either in the lumbar or cervical region. The result of this is paralysis of a leg or an arm, and may follow a slight rise of temperature during teething, or a slight chill, but the child does not give evidence of being very sick, and the matter is not considered of much moment and little attention is paid to the trouble.

It may be noticed that the child will drag the leg a little if old enough to walk, or there will be some difficulty in using the arm, but it is so slight that it is passed by as of little moment. If nothing is done, the child will eventually recover a partial use of the limb, but later an atrophy of the muscles occurs and results in deformity. During the period of the first symptoms there has been an inflammation of the anterior portion of the cord, where the nerves that supply the affected limb take their origin, and a certain amount of blood has been thrown out into the substance of the cord. Now if this condition is not recognized at this time, and measures taken to overcome the disease, a permanent destruction of the nerve cells occurs, resulting in a permanent atrophy of the muscles. Some times it is only one muscle of a group that is affected, or simply some fibres of a muscle. Of course, with a paralyzed muscle the opposing muscle being stronger, the affected limb is pulled in the direction of the healthy muscle, thus producing a deformity. This explains such deformities as the various forms of club feet, and also some of the spinal curvatures.

Infantile paralysis will not be cured by massage, but it is evident that the circulation in the diseased limb is much interfered with by the paralysis, and massage increases the circulation, thus aiding repair, strengthening the muscles and preventing deformity. This work, in connection with the medicinal measures that the attending physician may adopt, may prevent destruction of the nerve cells, and the muscles will then have been kept up to the best possible standard, and will be ready to respond to the action of the nerves as repair takes place at their point of origin. It is to be remembered that this curative action is very slow at the best, and the parents, patient, and masseur must be prepared for this. He will be required to use many of the different movements already described, but it is to be remembered that these movements cannot be used as they would in an adult. It is well to get the confidence of a child before beginning the treatment proper, and, to do this, tell some story to the little one that will call for the use of your hands on the child's body—the old "pat-a-cake, pat-a-cake"—and in a little while the patient will come to enjoy the massage. In these cases if the skin is very sensitive, some mild fat may be used as a lubricant, but this is not often the case. Effleurage will be a useful operation, and should be given with the thumb and index finger parted from each other, in small children the thumb and finger will encircle the wrist or ankle when the movement should be made from the ankle to the hip, or from the wrist to the shoulder. Paralyzed muscles are usually very flabby and lifeless, and at first very little will be accomplished in the way of making them contract. As the limb is not very fat it will be very easy to use **pincement** along the whole course of the muscle. By this operation every portion of the tissue of the muscle can be brought under the influence of the operator. You will remember that this is one of the operations that has been recommended for the reduction of obesity; it consists in picking up the tissue between the thumb and finger and rolling it gently back and forth, the pressure used must be graded by the sensitiveness of the skin, as the muscles fibres will not show much irritation from the operation. The massage should be used over the whole length of the muscle. If the limb is deformed, it should be placed in the normal position and retained in that position during the whole of the operation. **Tapotement** is one of the very best movements we have to stimulate muscular action, but it must be carefully used in the young child until he comes to see that you will not hurt him. All joints are to be passively moved and as soon as the muscles begin to assume tone they should be used as resistive agents. Paralyzed parts are always colder than normal and should have extra covering. The massaging of the back in young children will be best done when they are sitting on the mother's lap. After giving an operation the whole body should have some bland fat applied; it should not be so thickly put on as to show greasy, but only a very small portion used and applied during the last minute of the massaging. The length of time that it should take to give massage to a year-old babe should not exceed ten minutes, while in older children it may be extended to thirty minutes, but not any longer. Always finish the operation by massaging the spine. In the various forms of club feet that will come under your care, it will be found that certain muscles have been contracted as a result of the opposing muscles having been paralyzed, and you must be familiar with the normal position of the limbs in order to correct the deformity by massaging the limb with the deformity corrected, and by putting the contracted muscles on the stretch so as to overcome their contraction. You must remember that a contracted muscle may become a contractured muscle, which means permanent loss of the power of contraction, and ever after the muscle is useless. It is in the case where the contraction has become permanent that the surgeon is called in and divides the tendon or muscle. In general, the treatment for all cases of club foot is by the use of every normal movement that a healthy limb is capable of performing. In that form of club foot where the heel comes to the ground and the toes are elevated, special attention must be directed to the muscles of the calf of the leg, and, at the same time, the foot must be extended to overcome the contracted muscles.

In the variety where the heel is drawn up the toes come to the ground, and the inside of the foot is elevated, it is evident that the muscles that produce the opposite conditions by their contraction are the paralyzed ones, and the ones that need stimulation, so you will direct your efforts to the muscles on the front and outer side of the leg, and at the same time make the attempt to restore the foot to its proper position. In doing this latter, you put the contracted muscles on the stretch. To accomplish this the foot must be grasped with one hand, while the other holds the leg stiff, then make motion by moving the foot in every direction. The extension of the foot in these operations should last for three or four minutes, then the foot should be loosed for the same length of time and again extended. In many of these cases shoes and splints are used to keep the foot in place, and when they are replaced, great care must be used to see that they are properly applied, as paralyzed limbs are more liable to injuries, and lesions on them are very slow in healing.

Added to the rest cure for the treatment of chorea, massage applied twice a day is of much benefit, the patient being in bed all the time. Patients suffering from chorea are very nervous, of course, and such movements as tapotement or other stimulating operations would be out of place: only the treatments that are soothing and sedative in character are to be given.

Effleurage in all its varieties will be the movement indicated, and must be given very gently, beginning at the upper part of the spine, with the circular motion and using it the whole length of the spinal column. As soon as the muscles are under control it is well to begin active movements of an arm or leg, getting the patient to concentrate the will in an effort to make the muscles contract regularly. These motions should be very slow at the beginning, but as the case progresses may be made more rapidly and at the same time, other sets of muscles are similarly exercised. If the patient fails in an effort do not try it again immediately; give a little time for rest.

The time of a massage treatment for a case of chorea should be about thirty minutes, and two treatments should be given a day. In the treatment of the different affections of the extremities it is necessary that an accurate knowledge of the situation of the different muscles, blood vessels, and nerves be acquired, and we will devote some time to a study of regional anatomy, and at the same time study the physiology of some of the most important organs. We shall begin with the hand.

You will remember that the fingers have fourteen bones, which are called phalanges; the thumb has only two of these. These bones are joined together at the ends to form joints, and the motion of these joints is limited to flexion and extension. At their bases these bones articulate with the five metacarpal bones, and the motion of the four fingers at these joints is principally flexion and extension, but there is also a little motion to either side as well. With the thumb the motion at this joint is in every direction, enabling the thumb to be brought in contact with nearly every part of each finger. Between the bases of the metacarpal bones and the bones of the forearm are eight irregular bones placed in two rows. The motion between any two of these bones is very limited, but they assist in forming the wrist joint in which there is motion in every direction.

Two long bones form the forearm —the radius and ulna. The ulna is on the outside of the arm and has little to do with forming the wrist joint; its lower end forms that bony prominence that is seen at the outer side of the wrist. At its upper end it articulates, with the humerus to form the elbow joint, in which the motion is flexion and extension only. The radius, at its lower end, forms a part of the wrist joint, and flexion and extension is the motion. But the hand and the arm are capable of being rotated forward and backward (pronation and supination). How are these motions accomplished? The upper end of the radius is held to the ulna by a ring of strong fibrous tissue in which it revolves, allowing the rotating motion mentioned. The humerus at its upper end has a rounded head that fits in a socket on the shoulder blade, forming a ball and socket joint that allows of free motion in every direction. If you become familiar with these motions, you will readily detect any interference with normal movements. In the formation of the joints the bones are held in place by strong ligaments and lined by a membrane that furnishes a lubricating fluid for the articulations.

There are a great many affections of the joints that will interfere with their action. Inflammation of serous membranes (and the lining membranes of joints are serous membranes) is attended with an exudation which destroys the serous membrane in part, and, not only interferes with its function as a lubricator, but by forming attachments it prevents motion. With an inflammation, the structures about the joint become affected and attached to each other, forming a mass of tissue that interferes with the free motion of the joint.

Bacteriology

Lecture No. 9

CLEAN HANDS.

"What, will these hands ne'er be clean?"

It has been said that the modern surgeon "is, or should be, the cleanest man that walks the earth." If we look at the surgeon's hands we shall see that they are the hands of a gentleman; white and clean; kept with care and well acquainted with the use of soap and water. But the surgeon's hands, clean to the eye of the looker-on, are the weakest link in the cain of asepsis and antisepsis. In the crevices and wrinkles, under the nails, down in the depressions, imbedded in the tissue lurk unseen death-breathing particles of infection from which there has not been found an effective method of relief.

In the medical press, in the association meeting, the question: "Can the surgeon's hands be sterilized?" has become a threadbare subject for discussion.

Numberless germ-killing agents have been discovered and no end of methods for hand-cleansing have been tried and abandoned; still the problem remains unsolved.

In the practical suggestions offered it is observable that the mechanical methods seem the more promising in their results, and further, that the intelligent use of such simple material as soap and water is essential under every procedure thus far devised.

It may be, therefore, that the goal of cleanliness for the hands is not far away, and when found will be a process that is not only very simple but which is also effectual.

DISINFECTION OF THE SURFACE OF THE BODY.

Since Eberth, in 1875, demonstrated the presence of various bacteria in normal prespiration, and described the colonies which they form upon hairs, a number of investigators have interested themselves in the germs on the surface of our bodies, and, as a result, there have been discovered a great profusion of organisms.

While the tissues in the interior of our bodies are free from bacteria, the outer surface simply swarms with organisms of the most varied species,—moulds, yeast fungi, bacilli, cocci, and color and odor-producing bacteria are present in numberless heres. And this is not surprising, as all the conditions which the lower organisms require for their existence, are found associated upon the surface of our body. A uniform temperature favors their growth, the secretion of the cutaneous and mucous glands provides the necessary moisture, and dead epidermal cells, animal and vegetable substances of the most varied origin afford the necessary culture-medium. It is true we have not as yet been successful in separating out of this conglomeration a special class or a number of special varieties, as particularly epithelial germs; it appears to be rather a diversity of forms which are present. In a very fluctuating way, first one variety and then another is predominant. The opinion of Bordeni, that the inhabitants of every land and every region have their special and peculiar epidermal bacteria, may be accepted as correct; indeed individuals of every occupation may have their characteristic germs nesting upon them, according as their vocation brings them in contact with different organisms. We encounter bacteria with extreme frequency, and they adhere to the surface of our bodies with such readiness that after only a transitory contact with a material containing germs its distinct traces will be found upon the individual even though apparently perfect cleansing be practised. Nothing in this particular is more intstructive than the observations of Furbringer. This scientist engaged in work for short intervals in his garden, and found that, even after washing his hands, various garden bacteria remained about the finger nails. At another time he handled specimens of urine, and later investigations revealed to him the presence upon his hands of numerous germs of the micrococcus urea group, which are the cause of the alkaline fermentation so frequently observed in voided urine.

The regions which are covered with hair, also those in which the product of the sweat glands is especially abundant—the axillary space, the interdigital folds, and the furrows about the anus—are the places of predilection for the bacteria upon our cutis. The oral cavity (Miller) and the entire intestinal tract harbor normally myriads of micro-organisms. In the genital tract of the female, as far as the os uteri internum (Winter) also in the upper respiratory passages and in the outer part of the urethra, large masses of schizomycetes are present; and so are the conjunctival secretion and cerumen of the ear rich in germs of the same nature. These microbes, already vast in numbers, often increase to an almost incredible extent after only slight disturbance in the normal superficial continuity. An augmented secretion, a slight catarrh, or a mild degree of eczema, causes the thousands of germs to multiply to as many millions, and innumerable becomes the host when there is a suppurating wound, a fistulous tract, a superficial ulcer, an ichorous cancer, or similar conditions. We must confess that it is not as yet positively proven whether the germs of pus formation so much feared, and the genitors of the severe pyæmic and septicæmic processes, belong to the regular and customary micro-organisms of the surface of our body. Occasionally, according to all observations, they are present, and the luxuriant development which normally exists implies that as the various non-pathogenic micro-organisms find upon the cutaneous and mucous surfaces the conditions necessary for their growth and proliferation, so also may the pathogenic bacteria colonize upon our bodies as our vocation or incident exposes us to them.

REQUIREMENTS FOR THE STERILIZATION OF SKIN AND HANDS.

Among the requirements which must be carried out, if we wish to attain sterilization of the skin without the use of chemicals, are the following:-

I. The method must work with entirely aseptic and purely mechanical operative material.

II. The preliminary cleansing may be done in clear running water, but the final rinsing must be accomplished in sterile running water.

III. The agents employed must remove the scurf of the skin and rinse it away.

IV. The soap selected for the loosening of skin scales must be a solvent of fat and must contain alkaline principles which emulsifies the fats of the skin.

V. The act of disinfection must not injure the skin, and must insure thorough satisfactory disinfection.

VI. The entire process of disinfection must be brought to completion in one continuous and uniform act.

VII. The aim of the rational asepsis is the washing away of bacteria as well as their extermination.

The necessity to employ materials absolutely free from germs is self evident.

Brushes are the great if not the greatest source of fault. They can only with great difficulty be kept sterile, or even clean in the ordinary sense. They are absorbers and preservers of dangerous contaminating material which can only be removed by repeated sterilizations. Burning after once being used is the only sure method to avoid transference of infective matter through the brush.

Likewise, alcohol is a liquid of doubtful sterility, never sterile after once being used.

Danger of deficiency in asepsis increases as the operations multiply in number with the use of non-aspetic, or partially aseptic material.

Destruction of bacteria upon the skin has failed in practice and shown to be impossible of attainment, because all measures taken against the life of bacteria endanger also the living material of the cells of the skin.

Skin Scurf—The necessary point of attack in the asepsis of the skin is the skin scurf and the bacteria clinging upon dead material. In almost every instance they may be found accompanying excretory desquamative, necrotic products of the skin as their life is supported by these portions of the tissue. In the nature of the case, therefore, the less desquamated material and the less scurf our epidermis bears the fewer chances we offer for refuge of bacteria. The deeper we pentrate into the epidermis, the nearer we come to the layer of malpighi and of necessity so much more by nature is the skin made sterile. We cannot, however, in practice, carry this to a logical conclusion. The constant filing away or burnishing the hands with a rough material like sand, sapolio, pumice, etc., would soon render them so tender as to become impracticable; again, we are confronted with the problem that the skin does not present a smooth and even surface, that depressed, sweat, sebaceous and hair glands sink deep tubes into the epidermis and cuticle, the inner surface of which contains secretory material with which will be found the bacteria.

Ordinary disinfection or ordinary scrubbing does not reach these depressions. It is desirable to reach this skin scurf and the embedded bacteria and expel them by rinsing them away.

In the region of the nails and other parts of the hands, there are increased layers of hornlike thickening of the ceraline layers of the skin which are with difficulty loosened even by the most vigorous mechanical rubbing. Such layers are most numerous in the hands of those who, through the use of chemicals, alcohol, corrosive sublimate, etc., have brought about a callous process. These horny scurf layers must be softened, loosened, and finally removed.

Alkaline Soaps—The soaps ordinarily employed for hand disinfection do not losen the horny cell layers. Such soap should not be neutral but alkaline. An alkaline soap renders the ceraline substance at once soft and pliable.

By means of the alkali, the fats and perspiration acids of the skin, cholerstine and wax acids, are rendered soluble and removable by water.

The natural and unnatural fats of the skin not only harbor bacteria but likewise bear the products of bacterial action, ferments, toxins and other agents that are liable to be productive of imitation.

We may here call to mind, that chemical agents are in themselves liable to aggravate these conditions upon the epidermis

An exact condition of cleanliness would require that these crystalized and hardened fatty soils should be dissolved and removed.

Whoever wishes to remain clean must always have a healthy skin, for every irritation of the same, each hyperkeratos or hyper-secretion, each secretion anomaly results in a culture (soil) for bacteria growth. Every chemical put upon the skin becomes a scientific fertilizer for the bacterial field. The less chemical disinfection we use upon living material so much better must be the chances for an absolute sterilization. And the further we proceed with purely mechanical sterilization the more we find this does not injure the skin, but even strengthens it. A means of disinfection which attacks the living energy of the bacteria must unconditionally attack also the energy of the skin, and these it can only repel by hyper-functions, increased desquamation, rete malpighi regeneration. But, therewith, goes hand in hand the heightened hyper-secretion, hardening and scurf-creation, and these form for the swarming bacteria excellent breeding places and homes.

The work of exterminating bacteria from the skin by chemical agents cannot be followed without destroying the skin. The act of removing bacteria from the skin by mechanical operative procedures (driving them away) may be constantly pursued.—Dr. C. S. Schleigh in "Neue Methoden der dheilung; Ihre Bedingungen and Vereinfachung fur die Praxis."

BACTERIA OF THE SURFACE OF THE BODY.

The following species of bacteria have been found upon the surface of the body:

Non-pathogenic—Diplococcus albicans tardus, Diplococcus citreus liquefaciens, Diplococcus flavus liquefaciens tardus, Staphylococcus viridis flavescens, Bacillus graveolens, Bacillus epidermidis Ascobacillus citreus, Bacillus fluorescens liquefaciens minutissimus, Bacillus aureus, Bacillus ovatus minutissimus, Bacillus albicans pateritormis, Bacillus spiniferus, Bacillus of Scheurlen, Micrococcus tetragenus versatilis, Bacillus Havaniensis liquefaciens.

Pathogenic—Staphylococcus pyogenes albus, Staphylococcus pyogenes aureus, Streptococcus pyogenes, Diplococcus of Demme, Bacillus of Demme, Bacillus of Schimmelbusch, Bacillus of Tommasoli, Bacilus saprogenes II, Bacillus parvus ovalus.

BACTERIA OF THE SURFACE OF THE BODY.

The beard as a source of infection—Huebener (Centralbl, fur Chir., No.

11, 1899) found by holding petri dishes containing agar a short distance under the beard while a sterile instrument stirred the same lightly that 42.3 per cent of twenty-six beards thus examined contained pus-producing germs.

EXPERIMENTS IN HAND DISINFECTION.

Dr. Leonard Freeman, of Denver, Colorado, at a meeting of the American Surgical Association, detailed the following in using instruments in hand disinfection:

In the early days of surgical cleanliness the sterilization of the hands was supposed to be easy of accomplishment, but we have gradually learned that it is an exceedingly difficult and complicated problem. The microorganisms, unfortunately, are not strewn upon the surface of the skin like grains of salt upon a plate, but they lie in creases, between and beneath the epithelial scales, and down deep in hair follicles and the openings of sweat glands. The regions about the nails offer particularly favorable hiding places. It is extremely difficult to reach all these micro-organisms with antiseptics, not only on account of their impregnable positions, but also because they are protected by grease and by being bunched together. The full significance of this bunching together is not always recognized. An antiseptic will kill the germs on the outside of the bunch, but cannot reach those within. Some time ago I dried portions of a culture of the staphylococcus pyogenes aureus on a platinum wire and immersed the instrument for half an hour in five per cent. carbolic acid. The antiseptic was then washed away in boiled water and the wire plunged into gelatin. A luxuriant growth was obtained.

After operating for some time, the hands, which were apparently sterile at the beginning, are often found to be seriously contaminated. In discussions on this subject this is usually said to be due to maceration in the fluids of the body and to friction on tissues and instruments. It struck me that this explanation was not sufficient. It might account for the appearance of a number of germs, but it could not account for all of them. The preliminary scrubbing and maceration of the hands would certainly dislodge most of the bacteria capable of being dislodged by these means. It seemed likely that many germs were floated out of the pores by perspiration, which is generally excessive, owing to the heat of the operating room and the nervous tension of the operator. This hypothesis would also account for the greater number of bacteria which appear upon the hands when rubber gloves are worn.

In order to test the point I made some experiments, in which I assumed that a single finger, with its palmar and dorsal surfaces, its joint creases, and its nail, fairly represented the entire hand from a surgical and bacteriological standpoint. As a culture medium I employed gelatin contained in morphine bottles, each bottle being about two-thirds filled. A finger inserted into such a bottle snugly fits the opening, thus excluding atmospheric contamination. In each experiment the finger was left in the warm melted gelatin about ten minutes, and continually moved about and rubbed against the bottom and sides of the receptacles, thus stimulating as far as possible, the friction maceration, etc., of a veritable operation. The flesh was frequently pushed away from the nail against the bottom of the bottle, so as to freely admit the gelatin to the subungual space.

Many experiments made to determine the value of methods of cleansing he hands have been rendered valueless by neglecting to remove all traces of the powerful antiseptics employed before immersing the hands in culture media. Very small quantities of an antiseptic such as bichloride of mercury are capable of inhibiting germ growth to a considerable extent. It is not sufficient to rinse the hands in boiling water; chemical means must be employed. Ammonium sulphide answers the purpose well, and it is astonishing to note, when bichloride has been used, after careful rinsing in plain water how black the fingers will become upon dipping them into the ammonium compound. (The stain can be removed with chloride of lime

DISINFECTION OF THE SURFACE OF THE BODY.

Experiment 1. Hands scrubbed in warm water and soap, nails cleansed, hands scrubbed, washed and soaked in alcohol and then in bichloride, rinsed in boiled water, index finger dipped in ammonium sulphide and then brought into gelatin. About thirty cultures were obtained.

Experiment 2. The hand was then wrapped in sterilized towels and thoroughly perspired for some minutes in a Beck's hot air oven. Another immersion of the same finger in gelatin furnished about sixty cultures, just double the original quantity, although the same finger being used, the number should theoretically have been less.

Experiment 3. The hand was then re-scrubbed and resterilized, and the finger again placed in gelatin. But fifteen cultures were obtained.

Experiment 4. The sweating process was again gone through with, following which but two cultures apepared in the nutrient medium.

It was thus demonstrated that, although sweating the hands in this instance doubled the number of micro-organisms, a second sweating failed to bring any more to the surface.

It being quite certain that the finger nails are the most prolific sources of infection, it occurred to me that by using, in addition to the usual cleansing, a small rapidly revolving brush attached to a dental engine, I might clean beneath the nails much more effectively than is usually done. It certainly seemed that I could brush the subungual space with the most minute thoroughness; but much to my surprise I obtained so many colonies in the gelatin that I was practically unable to count them. It seemed that I merely succeeded in loosening up the micro-organisms. On another finger of the same hand, upon which the revolving brush was not employed, the germs were found to be much fewer in number.

In order to exclude error, the experiments were repeated with similar results. Wishing to be certain that some of the cultures did not arise from germs contained in the ammonium sulphide I poured a little of that compound into gelatin on two separate occasions with negative results.

I also took occasion to test several processes of sterilizing the hands which are in common use; the chloride of lime method, the [illegible] method, and the permanganate of potassium and oxalic acid methods. With the two first mentioned I obtained so many colonies throughout the gelatin that I could not count them. This I attributed largely to the fact that I copied fairly accurately, the conditions of a surgical operation by soaking a finger for ten minutes in warm gelatin, rubbing it with force against the sides and bottom of the bottle and admitting the culture medium freely beneath the nails

Many experimenters, I believe, have contented themselves with simply immrsing the hands in nutrient gelatin and perhaps moving them about a bit, which is not sufficient. With the permanganate method between fifty and seventy-five cultures grey; hence this process, according to my experiments, stood next in efficiency to alcohol and bichloride.

Keinicke was unable to render his hands aseptic either by brushing them for fifteen minutes with green soap and hot water or by the use of five per cent. carbolic acid, 1-1000th bichloride of mercury, sublimate soap, chlorine water, one per cent. lysol, tricresol, or sand soap.

Based upon my own experiments and those of others, I feel that the following propositions are approximately correct:–

1. None of the methods of sterilizing the hands can be absolutely depended upon. Many positive results are arrived at by means of faulty experimental technique, the culture media becoming impregnated with antiseptics, the skin temporarily hardened by alcohol, formalin, etc., or the hands not subjected to sufficient maceration and friction in the culture medium.

2. Under circumstances where it seems desirable to do so, much may be accomplished by sweating the hands in a hot-air oven, by wearing rubber gloves for some time prior to an operation, or by immersing the gloved hands in hot water. In other words, giving the hands a Turkish bath. Mere prolonged soaking in very hot water, although not so effective as dry, hot air, must have some favorable effect. It is difficult to understand, however, how the sweating method can dispose of all the micro-organisms beneath the nails. The procedure will hardly be extensively employed, owing to its inconvenience.

3. Excessive brushing bneath the nails, as much even as the sensitive tissues will tolerate, seems merely to stir up the bacteria. We can hope to accomplish little by this means.

4. So far the only really reliable means of rendering the hands aseptic is to incase them in sterilized rubber gloves. But if the gloves become torn, as they often do, the danger of infection is considerable, owing to the bacteria which have accumulated beneath, from perspiration.

5. Coating the hands with various substances has been tried and found ineffectual.

6. Cotton gloves, although they soon become contaminated by exudation from the skin, probably do some good, especially if frequently changed, by fiytering out the bacteria, as it were, and preventing their entrance into wounds.

INSTINCTIVE CLEANLINESS.

Schleigh maintains that it is the duty of a surgeon to take care of his hands even more outside of his professional occupation than while employed in it, for the reason that it becomes easier to cleanse ones self for an operation, the cleaner one has kept himself during the period of rest. The centre of gravity of surgical clanliness is based more upon the skin's instinctive cleanliness and care of the skin than upon it per force in one single operation. The one who is ever watchful about his personal cleanliness will find it easier to present himself aseptic for an operation. Cleanliness for its own sage is the surest way to easily fulfil the object of being useful to others. The germ freedom of the hands made possible by the many daily sterilizations, if properly performed render it difficult for bacteria to exist upon the skin. The skin may be made sterile by means of fractional aseptifying just as liquids are made sterile by fractional heating. This work of driving away bacteria from our bodies must be constantly pursued. In the clinic the requirements are whoever has nothing to do must sterilize himself.

The duty is always necessary and paramount

This cleansing should be performed even without direct use for it even the cleansing for amusement or for instruction is of decided value. To it I attribute in a great measure the success which I enjoy, and it is of especial vaule where at a moment's notice call sounds for "All hands on deck."

In the beginning, a newcomer among us often sneers at this mania for cleansing, but smile disappears when he sees the results of our infection experiments, done for the purpose of controling or portraying our methods. He sees by the results that we have outstripped him and that he is manifestly unclean.

SCHOOL FOR CLEANLINESS.

Schleigh lays great stress on what he calls a "school of practical asepsis." He states that: "There is absolutely no better means to persuade the learner or teacher of his ability or inability to cleanse himself than by actual inoculation. The physician who from time to time views his own hands in the mirror of the culture tube will attain a well grounded knowledge as to whether he is clean or only thinks himself clean. Everything else is conjuncture and often a dangerous form of optimism, the truth is only brought out by a scientific examination Whoever knows how to remove bacteria from his hands will also know how to remove any other kind of impurities. It is quite certain that the more quickly we suceed in removing the living impurities the more certain we are to eliminate all other possible infection (ferments, rancid fats, acids, perspiration, particles of dust, tox-albumin, etc.)

"If I were to have the honor and good fortune to be an instructor of surgery, the first innovation which I should feel it my duty to inaugurate would be the institution of courses fitted to instruct my scholars in cleanliness. A school for cleanliness with organized courses of instruction in the art of surgical cleansing. I should require that each of my pupils should have passed through a course wheih would test his ability to render him aseptic for an operation. Such a course is a present necessity not only for young physicians, but for midwives, nurses and assistants of all kinds. This course in practical surgical asepsis would test the ability or non-ability of the scholar to free his skin from bacteria: it would teach him that germlessness is attainable. The inoculation results will teach the pupil that he is unclean and unprepared to handle wounds. It will bring him gradually to a point where he may gain for himself that which is the imperative condition. I would require that one after another of the pupils should frequently walk up to the cleansing bowls, pull of his coat, and disinfect himself. The instructor to stand ready with the inoculation needle and culture tube in hand. After he completes the act, his index finger is taken, the inoculation needle probed into the nails, into the creases and folds, and plunged into the culture tube, the tube bears a label with the name and the date of the person affix In one to three days the instructor writes the results of the test. Thus will it be demonstrated who has a talent for cleanliness and who has not. The young collegians will learn how to cut the nails, how to protect and strengthen the skin, the difference between being called clean and being aseptic. This idea may be called 'romantic,' and yet I urge these requirements in earnest. Where else can the embyro physician better learn the method for cleansing his hands from bacteria, than in such a manner? Usually from a high auditorium seat he sees the top of the heads of the assistants and hears the clatter of wash bowls, he copies the rules, 'first wash three minutes with brush and soap, then in alcohol, then in sublimate,' and if he does not have the good fortune to become an assistant he can only learn by his own sad mistake how to perform the act. On the basis of systematic drill he should convince hilself of the attainability of the highest aim. He should be taught that he can make himself aseptic. 'Not one bacteria colony has been picked out in the last ten inoculations.' 'If you hold fast to this method you will fulfil the required conditions of asepsis easily and perfectly in your private practice.' I think that such a course would give to the collegian quite a different feeling under his feet than the ground of timidity on which he now stands. The physician's hands should bring to the invalid health, and should they not learn perfectly at the university how they may fulfil the necessary conditions? It is as if some one were to learn the theory of organ-playing out of a book, and then pose as a master before a church organ. It should not be permitted for any one to attempt to operate aseptically who has never held in his hand the inoculation tube and the inoculation pin. It seems to me a reproach against our colleges that we should have no course of instruction in the practical cleanliness of the hands. In my own practice, the newly entering assistant must first of all learn to sterilize himself, he must pare away his nails down to the epidermis on the inner surface. He must watch closely as to how we perform the act of cleansing the hands and he must imitate us, and after disinfection must follow the inoculation test with the platinum pin. The newcomer will soon convince himself that he must first be a learner in order to become a master, and soon a wholesome strife begins to exercise its power. The goal of perfect cleanliness is attainable, and I know of nobody who having once attained it will give it up. Sterility of the culture tubes in at least 97 per cent. is the requirement that can be attained. What comes above that is mastery, what falls below is negligence. The good student will ever strive until he reaches the highest goal."

STERILE WATER.

An abundance of both hot and cold sterile water from the onset of preparation to the final cleansing up, is essential in every operation. If possible, such water should be free from both organic and inorganic matter. The most desirable water is that which has been distilled or filtered. Whatever may be its source, it should be boiled in a clean vessel for ten minutes. Seemingly trifling, but of vast importance is the suggestion that a portion of the water should be allowed to cool so that when required the temperature of the hot water may be lowered by adding cold water to it. Ice should not be added to water that is to be used for surgical purposes. Water resulting from melted ice is not sterile. Hot water for aseptic purposes may be quickly cooled by surrounding it with ice. The temperature of water should not be taken with the fingers unless they are surely aseptic.

The importance of sterile water for the disinfection of the hands and skin is self-evident. Aseptic practices have taught that the original wash basin even when filled with sterilized water does not fulfil the requirements of surgical cleanliness. Even a large bowl of water if used for the cleansing of both hands and the face without being renewed becomes a most dangerous practice. The present requirements are that the water for cleansing the hands and the skin must be that which has been boiled and kept ready for use in covered vessels and must be kept flowing through continuous pouring or else changed often during the washing. In the use of basins or simple bowls the matter just washed away immediately attaches itself to the hand as it moves about in the water. This can be avoided to some extent if the act of cleansing is performed with the hands raised quite outside the level of the water and the operator only plunges them into it for a hasty rinsing away of the loosened material. The nearer the hands becomes clean the longer they may be allowed to remain in the renewed sterile water without the danger of infecting the same. In the hospital or in the houses of patients where warm sterile water flows from the stopcock continuously, no danger of rinsing the infection into the bowl need follow.

Schleigh tells us that one cannot properly wash himself without a continuous exertion of energy to avoid reinfection, even in sterile water. He holds that one cannot properly wash himself and at the same time carry on a lively conversation, he deprecates the practice of using this period for the exchange of opinion, discussion of cases, etc. He says: "I simply consider it impossible to minutely cleanse oneself with concentration upon this act of my entire mental and bodily energy." "This thread upon which hangs a human life confided to us must be unconditionally spun with all the zeal at our command and with a certain enthusiasm which resembles the joyful proud feeling with which one holds the helm of a small boat carrying a valuable cargo fast in his hand, leaving no moment without attention whence and how the winds and sails stand. Timely withdrawals of the hands from the rinsing water, and proper renewal of the same, demand undivided attention and a careful survey of the whole range, scientific self-control and a consciousness which every one should follow."

SOAP AND WATER.

It is related that in connection with the Bureau of Health of a German city, a test was being made intending to show the most effective and economical method of disinfecting the woodwork of an infected premises. The method followed out was to smear the woodwork with a bouillon carrying a known species of becteria. This being done, the advocates of the various methods would apply solutions or vapor as the case might be, afterwards a portion of the woodwork would be scraped, and if no growth had resulted, the woodwork would be considered disinfected. At this trial all sorts of chemical disinfectant, including formaldehyde, sulphur, etc., in fact, every conceivable method was used and the results and costs tabulated. The item of expense ran from twenty-five cents to two dollars per room. The time varied from a couple of hours to a couple of days. While this trial was going on, an eminent professor challenged the experimenters to smear the premises with their infection, and allow him to apply a simple remedy. This was done, and the results showed all bacteria were destroyed, in less than one hour at the expense of a few pfennigs. The professor's method was exceedingly simple and effectual. He employed a scrub woman, gave her a pail of hot water and some brown soap.

The legion of writers upon the subject of disinfection of the skin agree on one point, namely, the necessity for thorough mechanical cleansing. It has been conclusively proven that the hands and skin cannot be rendered sterile by dipping or immersion in any of the disinfectants now known. On the other hand, an examination of every method which has received any share of approval has included the use of soap, either in the beginning or the end of the process and as an important part of the same. Soap and water may be considered by far the most successful antagonists with which to combat the microorganisms of the skin. This is not to be wondered at when we consider that a soap that is strongly alkaline is capable of dissolving and, by aid of the water, removing the layers of dirt and secretion which lie upon the skin surface. Even thick layers of dirt, scurf, blood, pus, although hardened, can be made to succumb to soap and water when properly and thoroughly applied. But it has been found by experience that the ordinary soaps are by no means destructive to bacteria. Many of the antiseptic soaps (so-called are useless and thus deceptive. This is especially true of the neutral and finer grades of toilet soaps, as well as the superfatted alkaline soaps; they have little or no action except upon the gross exterior dirt. They do not effect the masses embedded within the horny layers of the skin. Careful washing with a good toilet soap may make the skin clean as the word goes, but this is far short of aseptic cleanliness. Soap to render the skin thoroughly clean, must be decidedly alkaline. The presence of the alkali is necesary to soften the horny skin scurf, to emulsify the layers of fat, to neutralize the fat acids deeply embedded and dried hard in the depressions of the epidermis.

But herein arises the difficulty, the highly alkaline soaps obtainable—soft soaps, green soaps, or even the laundry soaps—are caustic in action, and the surgeon sees in the scrub woman's hands the energetic action resulting from their continuous use. The ordinary alkaline soaps are very pulpy and sticky, and this stickiness increases with the alkaline content. It is evident that soap of this character would embarrass the operation by making the skin rough and by binding the infective material under a slimy coat. The requirement is for a soap that is in itself soluble, smooth, and which is sufficiently alkaline to soften, dissolve and emulsify the secretions of the epidermis whatever may be their nature, and by thus rendering them soluble make them removable by water. All this must be accomplished without injuring the texture of the skin.

Given this sort of an agent and thorough and intelligent use, the caustic skin destroying chemicals may be relegated to the antiseptic junk shop. Under these conditions the hand and skin may be made aseptic by the easiest and most natural method that can be conceived, viz.: washing with soap and water, but requirement is the right kind of soap, the right kind of water, and the right sort of man to use them.

ANTISEPTIC SOAP.

Experiments with many of the so-called antiseptic soaps have shown that the power of the antiseptics which they contain is destroyed by the soap itself. And further, that in them the antiseptics in many cases retard the activity and destroy the value of the soap as a cleansing agent. In Synol, however, a combination of cresol bases has been made to combine perfectly with the saponaceous compound, in which they are perfectly compatible.

The base of Synol itself is a highly alkaline soap made of perfectly pure fats, and in addition to, and above the germicidal action, the soap is one which aids in destroying or emulsifying the fats of the skin and hardened secretions and softens and loosens the skin scurf, so that the bacteria infesting the depressions of the epidermis and its deeper structure may be destroyed and washed away. In other words, Synol is germicidal, mechanically and chemically, the mechanical and chemical agents assisting each other.

This liquid antiseptic soap has been used in several clinics and by private operators for a number of years and the reports of these observers show that Synol accomplishes the sterilization of the hands without irritation and without destroying or roughening the skin. On the whole, it renders the skin smooth and soft, thereby lessening the chance of its harboring germs subsequently. Indeed, the constant use of this soap keeps the skin soft and pliable and preserves cleanliness in the deeper structures.

Everything connected with the process of manufacture of Synol is absolutely aseptic, from the preparation of the soap base to the container in which it is out from the laboratory. It is put up in a sterilized container with a cap which practically seals the contents of the container, and the contents may be distributed over the hands without fear of contamination of the soap itself. Synol has also been shown to be a most excellent lubricant. It is, in fact, adapted to every conceivable use to which soap can be put, and has been found to be an excellent addition to the bath and toilet of the surgical operators, nurses, attendants and patients.

FINGER NAIL DIRT.

The progress of bacteriology has shown that aseptic surgery means scientific cleanliness; the same lines of investigation show how very dirty people can be. Seventy-eight examinations of the impurities under finger nails were recently made in the bacteriological laboratories of Vienna, and the cultivations thus produced showed 36 kinds of micrococci, 18 bacilli, three sarcine, and various varieties; the spores of common mould were very frequently present. The removal of all such impurities is an absolute duty in all who come near a parturient woman or a surgical wound. It is not enough to apply some antiseptic material to the surface of dirt; the impurity must be removed first, the hand antisepticized after. It is sometimes said that the scratch of a nail is poisonous. There is no reason to suspect the nail tissue; it is more likely the germs laid in a wound form a bacterial nest under the nail. Children are very apt to neglect to purify their nails when washing hands; and this matter is not always sufficiently attended to among surgical patients. Personal cleanliness is a part of civic duty, and, as Dr.

Abbott well expressed the matter in his address to teachers, should be taught to school children and insisted on in practice. The facts we have recorded might well form the text for a school homily, especially when any epidemic was in the neighborhood."—British Medical Journal.

STERILIZATION OF THE HANDS WITH SYNOL.

The hands are first immersed in water as warm as can be comfortably borne to wet them thoroughly, rubbing them together to accomplish this more thoroughly. Then a quantity of the Synol is poured into the palm of one hand and it is rubbed thoroughly into the whole surface by briskly rubbing one hand with the other. Then it is rinsed off under a stream of water from the basin faucet, or by dipping them into a basin of warm water. A quantity of the Synol is then poured on a stiff nail brush previously sterilized and every part of the hands, the fingers, about the nails and under the nails particularly, is scrubbed vigorously for two minutes (actual time).

The lather is now rinsed off and the nails, which should be kept short, are carefully cleaned with a dull nail blade or a flat pointed stick. Then taking a fresh supply of the Synol on the nail brush, the hands, fingers and nails are again scrubbed vigorously for three minutes more, after which the soap is rinsed off with sterile water as warm as can be comfortably borne. If this is done thoroughly, the hands will be sterile.

Afterwards the hands may, if desired, be rinsed off with warmg sterile normal salt solution But this need not be considered absolutely necessary.

When the forearms are to be sterilized with the hands, another five minutes must be consumed for this. The surface of the forearm, including the elbow and a little way above it, is first thoroughly wet with warm water. Then the pure Synol is rubbed into the whole surface with the hand, then with a coarse cloth upon which some of the Synol is poured. This should consume two or three minutes, then the soap is rinsed off under a stream of hot water. After this the surface should be scrubbed. with nail brush and Synol for two minutes and the soap rinsed off with hot sterile water several times.

When the hands are dried, only a sterile towel should be used.

When running water is not used for rinsing, and this is done by dipping the hands into a basin of water, the basin should be emptied and refilled with fresh water after the preliminary washing and again after the first scrubbing. Running water is much better for rinsing.

Where running water is not available, the rinsing may be done by pouring the water over the hands from a pitcher.

Fixed basins with stopper and chain should never be used, because they cannot be sterilized with any degree of certainty. When portable basins are used they should have no cracks and the inner surface must be smooth, and not rough. They should be previously sterilized by repeated boiling or by scrubbing with Synol and a sterile brush.

During an operation two basins of sterile water should be placed conveniently for the surgeon or his assistant to sterilize the hands when it becomes necesary. In one is placed a sterile nail brush and by the side of it a wide-mouth jar containing Synol. This is for scrubbing and washing the hands and the other is for rinsing afterwards. Another basin containing a two per cent. solution of Synol should be placed conveniently to be used for a hand douche when required to remove blood fragments of loosened tissue adhering to them.

Hot water running through a pipe and coming from the ordinary kitchen boiler cannot be relied upon as positively sterile. It is always doubtful if all of it has been submitted to the necessary degree of heat for a sufficient length of time, and it has not been filtered.

To be satisfactorily sterile, water should first be filtered, then boiled for half an hour at least.

The advantages of Synol for sterilizing the hands are, viz.:

1. It requires so little time, five minutes being sufficient when the process is properly carried out.
2. The hands are left soft and smooth, and are not roughened or cracked by it, and do not become cracked afterwards.
3. It does not leave an unpleasant odor behind.
4. It removes the odor of contamination.

SYNOL IN OBSTETRIC PRACTICE.

Synol is useful in obstetric practice not only for sterilizing the hands and vulva previous to making examinations, but also for lubricating the examining hand and instruments, for irritation of the genitals after labor, and for washing the infant, since ordinary soap does it very imperfectly.

The physician should thoroughly sterilize his hands before making his first examination by scrubbing them with nail brush and Synol for at least five minutes and rinsing them under a stream of hot water. The nails are to be cleaned, of course, during this process. The patient's vulva should be thoroughly irrigated with a one per cent. solution of Synol, or it should be washed carefully with the Synol on a pad of sterile gauze and irrigated afterwards. Then, if he remains with the patient and subjects his hands to no further contamination, he should rinse them thoroughly in a hot three per cent. solution of Synol, which should be kept standing ready, before he makes subsequent examinations. But if he goes away he should always scrub his hands thoroughly again on his return before making another examination.

If the hand is to be inserted into the uterus for the purpose of turning the child to deliver, or for removing the placenta, the forearm as well as the hand should also be scrubbed with nail brush and Synol.

Subsequent to labor during the lying-in period, and as long as the lochia continues, the external genitals should be irrigated freely twice every day with one per cent. solution of Synol as warm as can be comfortably borne. If vaginal irrigation is required, the same strength solution should be used for that purpose. At least two or three quarts should be used each time.

If irrigation of the uterus is required, there can be nothing better than a one or two per cent. solution of Synol, since it softens and removes the adherent debris better than any other antiseptic that can be employed.

When Synol is employed during the lying-in period as directed above, the usual objectionable odor about the obstetric convalescent is entirely obviated.

Synol should also be employed by the obstetric nurse for sterilizing her hands, and she should keep them sterile.

CLEANSING THE FIELD OF OPERATION ON THE SKIN SURFACE.

The surface should first be lathered with the Synol, then shaved closely, removing all hairs. A piece of gauze, folded into four or eight thicknesses, large enough to cover the surface for three or four inches on all sides of the proposed incision, is spread thickly with Synol undiluted, so as to saturate it. This is done by placing the folded gauze on a flat, clean surface, and pouring the Synol over it, spreading it over the surface with a clean knife or spoon. This pad of gauze, saturated with Synol, is laid over the surface of the skin covering the site of the proposed incision and over this is placed a layer of sterile cotton which is held in place by strips of Z. O. adhesive plaster and a bandage.

This is permitted to remain from four to six hours, when it is removed and the surface scrubbed with nail-brush and Synol, then rinsed off with warm sterile water and dried with sterile gauze and afterwards covered with a pad of dry sterile gauze, which is not removed until the patient is placed on the operating table. This process is described for the benefit of those who believe a soap poultice necessary before incising the skin. Thorough scrubbing with Synol is sufficient to sterilize the skin.

The method advised, which is absolutely reliable, is to scrub the surface thoroughly with a gauze pad or nail-brush, saturated with Synol and wash off with sterile water as hot as can be comfortably borne. Then the surface should be shaved and again scrubbed. This is done twelve hours before the operation, and a pad of sterile gauze is placed over the surface scrubbed, and held in place by a bandage. If the skin has been irritated by the scrubbing, it should be dusted with Markasol under the gauze pad. This is removed when the patient is placed on the operating table and the surface is again scrubbed and rinsed with hot water as before.

In thin-skinned, sensitive women the nail-brush cannot be used.

When the abdomen is to be prepared for incision, the whole surface from the ensiform cartilage to the pubes and out to the limit on both sides is to be scrubbed and shaved. The depression of the umbilicus must be given careful attention, and in addition to scrubbing with nail-brush, the Synol must be poured into it, and then it should be scrubbed thoroughly with a pledget of gauze grasped in forceps or wrapped around a blunt stick or applicator.

The scrubbing should always be repeated on the table and after the soap has been rinsed off with plain hot sterile water, it may be rinsed again with warm sterile normal salt solution.

SYNOL IN DENTISTRY.

A dentist whose hands or fingers must go into a person's mouth should above all others have clean hands. The mouth, of course, is not the cleanest part of the body, yet everyone regards his own individual mouth the cleanest, and as a rule would not permit contamination from another if he knew it.

It is well known that both the staphylococcus and streptococcus are present on the hands of all persons, and we must believe that these germs at least and many others, no doubt, are present on the hands of every dentist who uses nothing more than the ordinary process of cleansing the hands. Though he may scrub them with nail-brush with the ordinary soaps, the hands are still not clean. He may perfume them to render them more attractive, but it is a delusion. They are still unclean.

With Synol and hot water, a thorough scrubbing with nail-brush, will render the dentist's hands positively sterile. He can certainly afford time between patients for this purpose. Very soon his patients will insist upon it, or leave him for some competitor who is more careful.

STERILIZATION OF INSTRUMENTS.

The sterilization of instruments may be accomplished with Synol by two processes, viz.:—

First:—The instruments are first washed thoroughly with Synol, using a nail-brush and having the instrument resting upon a hard surface, such as a marble slab. Then, after rinsing off the soap, they are tied up in clean towels, placed in a boiler with two per cent. Synol solution and boiled for three minutes.

Repeated boiling undoubtedly injures metal instruments by destroying their temper and causing them to lose their polish and eventually to rust.

Second:—The instruments are first placed in a basin or pan, and covered with a warm solution of Synol (two or three per cent.) to soften and loosen the blood, pus, etc., that has dried on them or which adheres to them. Five or ten minutes' soaking in this solution is sufficient. Each instrument is then lifted out separately and the smooth parts are rubbed thoroughly with a pledget of gauze soaked in the Synol pure, and the serrations and locks are scrubbed with a nail-brush saturated with the Synol, the instrument being laid on a hard surface, or the nail-brush may be used on the whole surface.

When the scrubbing of each instrument is finished, it is placed in a clean basin with the soap still adhering to it. When all are finished, the soap is rinsed off by pouring boiling hot water over them repeatedly until evidence of the soap remains.

The instruments must not be handled after they have been rinsed, but must be dried with a sterile towel or a piece of sterile gauze.

Edged instruments (scissors a [illegible]) must be sterilized separately, so as to obviate contact of their cutting edges with the other instruments. Scissors must have their locks and handles well rubbed with a pledget of gauze soaked in Synol, taking care to go over every portion of the edges thoroughly. They are then placed in a shallow pan with their blades separated and some of the Synol poured over them. After five or ten minutes this is rinsed off by pouring boiling water over them.

Knives with metal handles are sterilized in the same manner, but if the handles are smooth and not roughened, the nail-brush need not be used. If the knives have ivory, bone, shell or ebony handles, they can only be satisfactorily sterilized after they have been washed as above, by boiling in three per cent. Synol solution for two minutes, or by passing the whole knife, handle and all, several times through an alcohol flame, holding them with a pair of forceps. The alcohol flame is obtained by pouring a small quantity of alcohol into a saucer and igniting it.

Hollow metal or glass instruments, such as double current irrigators, catheters, aspirating canulae, drainage tubes, etc., are to be sterilized by boiling in a two per cent. solution of Synol for three or five minutes.

MASSAGE

SYNOL AS A LUBRICANT.

For the Examining Hand and for Instruments.

The hands should always be washed clean or sterilized with nail-brush and Synol before a digital examination is made, for although the vagina frequently harbors germs, no physician should take the chance of carrying infection into it on his hands or the examining finger. The examining finger being clean, it may be dipped into a jar containing Synol and the examination proceeded with. Or a quantity of the Synol may be poured into the palm of the left hand and the examining finger may be coated with it by rolling it in the palm of the other hand containing the soap, which is then rinsed off the free hand by placing it under a stream of running warm water or dipping it into a basin of warm water.

After the examination the soap is easily washed off under a stream of water from the basin faucet or in an ordinary basin of water, more of the Synol being used to wash the hands clean again. A nail-brush will not, however, be required always for this washing unless another examination is to be made in another case afterwards.

For the physician's own protection in most instances the vagina and vulva should be thoroughly irrigated with a one per cent. solution of Synol in warm water before the examination. The distention irrigation method is preferable, for by it only may the secretion be removed from the folds of the vagina by irrigation. This consists in filling the vagina to distention by compressing the vulva orifice, then permitting the solution to escape with a rush. This should be repeated some six or eight times.

This is done preferably after the patient has been placed on the table and after the character of the secretion has been noted or a specimen has been taken for examination under the microscope.

Where inspection before the irrigation is not required, the irrigation may, under some conditions, be entrusted to the patient before she gets on the table.

After the examination, the soap adhering to the vulva should be wiped off, first with a damp cloth, then with a dry one. A towel or a wad of absorbent gauze may be used for this purpose.

SYNOL IN THE BATH AND TOILET.

The importance of producing and maintaining a normal activity of the skin, both of the patient to be operated upon and the surgeon and his assistants, cannot be overestimated. As a fact, it is a point that is often underestimated or actually disregarded. It is well known that the staphylococcus pyogenes albus or staphylococcus epidermis albus is a regular inhabitant of the epidermis and hair follicles. The only way they can be rendered harmless is to keep the skin active by freeing the surface constantly of the gummy coating formed by mixing of the epithelial scales with the secretion from the sweat glands and thus permitting these glands to discharge their secretion freely upon the surface in a condition so it may evaporate readily. These bacteria infest the skin so deeply that chemical disinfection of the superficial layers does not destroy them. Therefore, one or even two washings with soap and then with antiseptics will not destroy them.

MASSAGE

There is no doubt that persons who consider themselves clean are far from being so in a surgical sense, because they do not bathe frequently enough or they do not bathe properly, or they do not wash with a soap that will clean the skin properly.

Therefore, in the preparation of the patient for an operation, to obviate infection of the wound from the incision of the skin or penetration of the needles employed for inserting the sutures to close the wound, the skin of the whole body should be rendered active by daily cleansing baths for as long a period as possible before the operation. This will also have a marked effect upon the general health of the patient, for by rendering the skin active and thus making it perform its function of elimination properly, it relieves the other overtaxed excretory organs.

It will be admitted that a heathy activity of the skin is essential for the surgeon himself and his assistants also, including nurses, because unavoidably their perspiration comes in contact either with the wound during operation or with articles that are in use. Therefore, a daily cleansing bath is important for them also.

Synol should be used for these baths, applied on a rough cloth or flesh brush, because, besides being antiseptic it possesses the power of cleansing the surface by loosening and dissolving the epithelial scales and oil of the perspiration that adheres to the skin in a manner not possible with any other form of soap.

Let any one who questions this statement take a bath as described with Synol and note the condition of the skin after. It is soft and smooth and not sticky as after the use of other soaps and no "dead skin" can be rubbed off.

The method of using Synol in the bath is as follows, viz.: The body must be completely immersed in warm or hot water until the skin is thoroughly wet, when necessary rub the surface under the water with the hand or a rough cloth. Then getting out of the water, the whole surface is scrubbed and lathered well with Synol on a rough cloth or flesh brush. The soap is rinsed off by again immersing in water of by a shower or spray tempered to suit individual taste. Whenever possible, a shower or spray should always be used after an immersion bath to remove the lather, because it stimulates the skin and washes the surface more thoroughly.

CLEANING INSTRUMENTS.

The difficulty experienced in cleaning surgical instruments has led a young Dutch physician, Dr. Jacques H. Polak, to experiment with the various methods used with a view of finding out which was the most reliable in the shortest time. He claims that, although a two per cent. soda solution in a closed vessel is most effacious, it is apt to blunt the keen edges of the instruments. Absolute or dilute alcohol, carbolic acid, formalin, and mercuric solutions were all unsatisfactory.

The best results were obtained by using spirit of soap, which killed all staphylococcus pyogenes within fifteen minutes. The spirit has, moreover, a valuable action, as it causes the pus to swell and thereby becomes more readily detached.

In sterilizing his instruments, Dr. Polak first places them in soap spirit for fifteen minutes a[illegible] then rubs them for not less than half a minute with a cloth saturated with spirit of soap. Fifteen minutes previous to an operation he places his instruments in the soap bath and either dries them with a sterilized cloth or rep[illegible] the soap by means of alcohol (50 per cent.) or a sterilized solution of boracic acid.

DISINFECTION OF THE HANDS.

H. Marx announces that the aim of disinfection of the hands should be to render them a de[illegible] soil for microbes, not necessarily to remove all germs, but me[illegible]ly [illegible] their further development. The standard for these condition[illegible] [illegible] or absence of the Babes-Ernst corpuscles, and this should be the gauge for disinfection of the hands.

FORMALIN DISINFECTION.

S. Spengler states that tubercle bacilli in sputa are not killed by formalin disinfection as usually p[illegible] [illegible] experience at Davos has shown him that complete de[illegible] [illegible] is certain if the room is kept at 25C during the [illegible] infected substances are moistened thoroughly and give o[illegible] moist [illegible] the influence of the fumes. The formalin must contain .5 to 1 per [illegible]mic acid.

DANGERS OF CARBOLIC DRESSINGS.

Dr. F. B. Harrington sounds a note of warning against the indiscriminate use of dilute solutions of carbolic acid as a dressing for wounded surfaces. He states that an aqueous solution of carbolic acid (one to five per cent.), if applied to an extremity, as the fingers or toes, for a number of hours, may produce gangrene and total destruction of the part. This result is directly due to the action of the carbolic acid, which slowly penetrates into the deeper tissues, where it acts directly upon the red and white blood-corpuscles, producing thrombosis, and so destroying the nutritive processes of the tissues. Nearly two hundred cases of this kind are to be found reported in recent medical literature, and Dr. Harrington urges the profession to teach the public some safer treatment.

Mechanical Vibration

Lecture No. 10

ANTIQUITY.

1. History records the use of massage about 3000 B.C. by the Chinese. We also have evidence of its very early employment by the Egyptians, Hindoos, Persians, Greeks and Romans. Plato, Julius Caesar and Pliny are among the famous men of antiquity who used massage movements to relieve and cure numerous kinds of ailments.

The early forms of massage were, undoubtedly unscientific, and it was not until the beginning of the eighteenth century that vibratory massage was therapeutically applied to the human body. Ling and Zander, the celebrated Swedish mechano-therapeutic authorities, discovered and developed the wonderful properties of vibration as a reinvigorative agent.

BARBER'S USE.

The use of massage in tonsorial parlors is of very recent origin. In 1905 the U.S.A. barbers began using massage machines and today every well equipped shop in the U.S.A. and Canada is using some kind of a machine.

The two principle machines are the hand and pedestal, the latter being the best because admitting of the use of a much larger, more powerful and permanent motor. The hand machine is the cheapest and there are many good makes on the market.

MECHANICAL VIBRATION.

2. The impulse is purely a vibratory impulse—a vibration, nothing else. It is not a concussion on one hand, nor a mere agitation on the other. It is just what its name implies, and just what is indicated as a therapeutic measure—a precise, exact, regular impulse.

It stimulates the tissues wherever its action is proffered. The impulse or succession of impulses is stimulating. Some "vibrators" (for this reason altogether unworthy of the name and distinction) bruise the tissues, and, in thus doing, disgust the operator.

The impulses may be imparted to the deep tissues quite as readily and conveniently as to the superficial tissues; and, in order to do this, it does not require any more exertion or heavier pressure. This, if there were no other splendid features, begets the best of confidence.

Again, it is under such control that its action is exerted where it is demanded, and there only. It is directed to a certain tissue, a given muscle, and there it expends its action.

Yet, localized as it may be, and as it is, there is that general system effect which is an exhilaration, a delightful feeling, a feeling of well-being and this effect or series of effects, becomes continuous, persistent, so that the local treatment is a factor in building up health.

There are no untoward effects. There is nothing in the action that interferes in any way with the functions of any organ or tissue.

MASSAGE

Medical men are enthusiastic, emphatic and optimistic in regard to its use. They tell of marked relief, radical improvement, gratifying benefit, renewed strength, wholesome operation, and all that goes to make up the value and virtues of a twentieth-century therapeutic agent.

It stimulates, invigorates, vitalizes; and the system that is stimulated, invigorated, and vitalized is the system that has nothing to do with disease conditions. The tonic effect is that which is interpreted by healthful action, by healthfulness of action, active healthfulness.

It is used successfully in all forms of general debility, tissue debility, lack of nerve ability, impairment of nerve capability, functional unreliability. It is of great value in exhaustion from overwork, whether legitimate or whether it be the effect of disease action.

The medical profession, through some of its most conservative members, has expressed itself heartily that an agent of such importance is producing results for health, and of such a description as to be within the reach of a'' and within the appreciation and esteem of medical science.

THE HEAD AND FACE MASSAGE.

3. For the Complexion— and, therefore, prophylactic of cutaneous disease. On the face, apply it upward over the cheeks, from the nose outward, downward on the neck, back and forth under the chin from ear to ear. The results as to improvements are so pronounced that it leads to commendation for general cutaneous health. The circulation is stimulated and the muscles are exercised It is patent to all vibra-masseurs that more general care of the skin by gently vibrating would be advantageous.

Much might be said as to the true cosmetic effect of vibra-massage. It develops the muscles, facilitates circulation, removes blemishes, and prevents the accumulation of unsightly masses of fat. This not only applies to the face, bust and arms, but to the entire integument. And "cosmetic effect, rightly interpreted, means nothing else than a clear and healthy skin."

4. Beauty of facial contour in women presents a perfect curve of the cheek, and the chin and jaw delicately rounded. Sharpness or angularity of features cannot be considered other than abnormal. Double chin and flabbiness are only caused by the muscles being inactive, thus allowing fatty tissues to accumulate. The object of the vibrator it to stimulate the tissues to throw off worn particles and to acquire new strength and material from the active circulation of the blood. Proper facial massage is as essential to the facial muscles as proper exercise is to the muscles of the rest of the body. The vibrator develops the muscles of the fleshy portion of the face, rounds off angular portions, improves the circulation — hence the complexion — removes wrinkles, facial blemishes, black-heads, and relieves muscular twitching. With persistent application, a harsh skin may be cleared of all blemishes, and be made smooth in texture and youthful in appearance.

SOME MOVEMENTS FOR THE FACE.

5. For the muscles of the mouth, close the lips and apply the vibrator back and forth across the lips and along the lips. From the corner of the mouth to top of ear.

From nose outward to the ear.
Upward over cheek from jawbone.
Back and forth under the chin from ear to ear.
Downward on neck from jawbone.
The last two movements are excellent for removing double chin.
Movements on the cheeks should never be downward.

TO REMOVE WRINKLES.

6. Wrinkles as often indicate unhealthy tissue as advancing age or mental strain. They are best removed by applying the vibrator over the skin—backward and forward—at right angles to the wrinkles, thus restoring the skin to its natural flexibility.

DIRECTIONS FOR FACIAL TREATMENT.

7. Vibratory treatment gives to the muscles of the face form, firmness, solidity, and strength. It is important that the face be thoroughly clean and a good skin food applied before using the vibrator. The circulation is stimulated in the tissues, the muscles are exercised and the skin food absorbed.

After treatment, wipe the face with a warm Turkish towelling cloth to remove any surplus food on the face, then press a cold cloth to the face, after which wipe the skin dry with a soft cloth.

FOR THE SCALP AND HAIR.

8. The hair itself does not necessarily become diseased, its failure is due to insufficient nourishment, which causes it to lose vitality; change color, weaken at the roots and fall out. The follicles of the hair need to be nourished to give them strength, and the scalp exercised to keep it elastic and loose. Therefore, to promote a healthy condition of the hair, prevent baldness and premature grayness, it is necessary to preserve a good circulation of the life forces of the hair and to call for their use and assimilation. The vibrator accomplishes this to perfection.

HOW TO TREAT THE SCALP.

9. Apply the vibrator in every direction, reaching all parts of the scalp and neck. Always finish the treatment by movements from the forehead over the top of the head and down the neck to withdraw the blood from the head and prevents any tendency to headache.

Keep your machine perfectly clean and when not in use keep it covered.

PROCEDURE.

1. Apply hot cloths to face and head to soften parts and open pores.
2. Apply rolling cream to take out all dirt.
3. Apply second layer of hot cloths.
4. Now apply your lubricating medicine, if massaging the face, so that your applicator will move easily over the part.
5. Always work out from the centre of the face.
6. When there are wrinkles, follow these with the applicator until they assume a smooth appearance.
7. Over the eyes,nose and lips do not press heavily and reduce your machine to a very mild vibration for these very sensitive parts.

8. Always apply some delightfully perfumed liquid, and a good aromatic powder to the face, as this contributes much to the feeling of comfort imparted to your customer who comes to you for massage.
9. Always remember the human hand is by far the best machine for massage, and that the vibrating massage is only used as a time and labor saver.
10. Strive to be as expert as possible and never get above being willing to learn.